

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
19 July 2001 (19.07.2001)

PCT

(10) International Publication Number
WO 01/52050 A1

(51) International Patent Classification⁷: **G06F 3/14**,
H04N 5/445, 7/14

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(21) International Application Number: PCT/US01/01054

(22) International Filing Date: 12 January 2001 (12.01.2001)

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(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
09/488,361 16 January 2000 (16.01.2000) US

(81) Designated States (*national*): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CR, CU, CZ, DE, DK, DM, DZ, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW.

(63) Related by continuation (CON) or continuation-in-part (CIP) to earlier application:
US 09/488,361 (CON)
Filed on 16 January 2000 (16.01.2000)

(84) Designated States (*regional*): ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).

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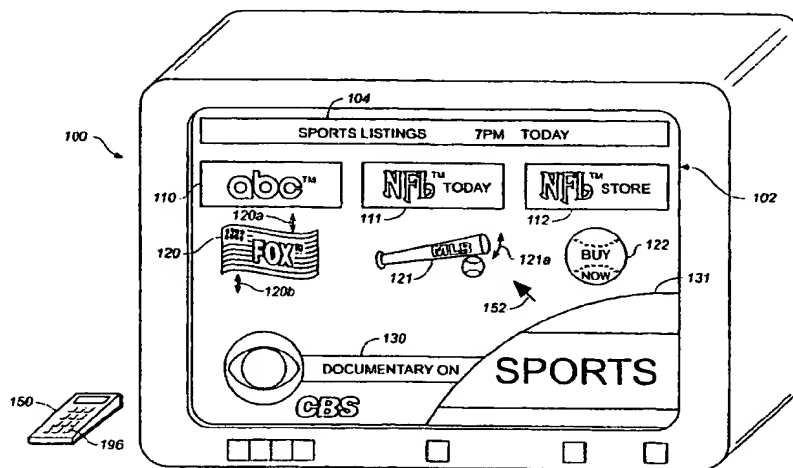
Published:

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— with international search report

[Continued on next page]

(54) Title: ELECTRONIC PROGRAMMING GUIDE



(57) Abstract: An electronic programming guide ("EPG") provides pictograms and logos (optionally with 3D characteristics) to indicate what television programs are showing. This display format is easier to recognize than prior art EPG formats. The EPG information can be displayed in a window within a television screen while a program is shown on the remainder of the screen. Thus, the viewer can know what is playing on the various channels while watching one of the channels. In one embodiment, the EPG is used with a remote controller having a help button for assisting the user. The EPG comprises geometric surfaces located in virtual 3D space. A 3D graphics pipeline applies the pictograms, logos, alphanumeric text and/or video clips to the geometric surfaces. The video clips can comprise programs, previews, or video data stored on a hard drive. The pictograms, logos, alphanumeric data and/or video clip appearance can be modified using a remote controller, e.g. by changing the geometric surface position or lighting. The pictograms, logos, alphanumeric data and video clips can be changed using broadcast data. Optionally, internet HTML pages are parsed and applied to geometric surfaces in 3D virtual space.

WO 01/52050 A1



— before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments

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ELECTRONIC PROGRAMMING GUIDE

BACKGROUND OF THE INVENTION

The present invention pertains to electronic programming guides ("EPGs").

Presently existing EPGs provide television viewers with on-screen television schedule information, e.g. in a convenient regular or non-regular rectangular grid format. One type of EPG is used in conjunction with an analog television system. In such a system, one of the cable channels is reserved for displaying programming information. The programming information is displayed in a grid, e.g. grid 2 of Fig. 1. Grid 2 comprises four columns 3-6. First column 3 lists the various channels of the cable broadcast system. Columns 4, 5 and 6 indicate what is showing on the channels listed in column 3 in half-hour increments. Thus, if one tunes to the EPG at 10:05 p.m., second column 4 displays what is showing between 10:00 and 10:30 p.m., third column 5 displays what is showing between 10:30 and 11:00 p.m., and fourth column 6 displays what is showing between 11:00 p.m. and 11:30 p.m. A row 7 at mid-screen indicates what time slots columns 4 to 6 correspond to. (A portion 8 of screen 9 above row 7 usually provides continuous advertisements.)

In most cable TV systems, there are more television channels than there is space for rows in grid 2. Accordingly, grid 2 typically scrolls at a pre-selected slow rate, so that a viewer can see what is showing on all of the channels.

The information contained in an analog EPG is typically broadcast by a cable operator on a dedicated one of the channels of the cable TV system.

1 Most digital EPGs operate in a different way. In a digital EPG, program
2 schedule information, and sometimes applications and/or systems software, is
3 transmitted to equipment located on the viewer's premises (usually a "digital set-top
4 box" or STB) by way of broadcast, cable, direct satellite or some other suitable form
5 of transmission. The STB contains memory (and is in essence a dedicated computing
6 device) so that the program schedule information can be stored for later viewing. The
7 program schedule information stored in the STB is periodically updated (e.g., on a
8 continuous, daily, weekly, or biweekly basis). A microprocessor within the STB
9 cooperates with the viewer's television set to display the stored program schedule
10 information and to implement other functions of the EPG in response to user-
11 generated signals. The functions available depend on the sophistication of the
12 particular EPG.

13 Digital EPGs are often used in an interactive television system. In an
14 interactive television system EPG, a user may browse schedule information in any
15 order, select programs from on-screen menus for current or future viewing and order
16 pay-per-view programming on demand. Some EPGs permit other functions, e.g. an e-
17 mail function, or a function that permits a user to block certain kinds of programs
18 such as adult or violent programs.

19 Collectively, prior EPGs fail to provide viewing capabilities that realistically
20 address the viewing habits of the users of these systems. As mentioned above, an
21 analog TV EPG is viewed on a TV screen as a permanently scrolling rectangular
22 table. This solution does not require from users any additional interaction and is
23 suitable for a completely passive television viewer (the so-called "couch potato").
24 Unfortunately, this is a poor solution for interactive TV, because:

1. The scrolling speed is constant and cannot be adjusted.
2. In an analog EPG system, the user cannot switch to the channel of choice immediately from the EPG (e.g. by clicking on a display of a channel number on the EPG). Instead, the user must input the channel number with a remote controller.
3. The analog EPG scrolling table is completely sequential (providing information in an order depending upon channel number) and the user cannot pre-sort schedule data or otherwise personalize the EPG.

A two-way interactive EPG is more sophisticated. Unfortunately this solution also has many problems. Interactive EPG systems provide drop-down menus that require multiple steps in order to interact with the EPG, which is very frustrating when a search for a desired program is unsuccessful. The EPG is inflexible in terms of menu design, because the menu itself is a set of regular two-dimensional grids.

Some of the other problems with prior art EPGs are as follows.

1. Program Description Truncation. When displaying schedule information in grid format, i.e., columns representing time slots and rows representing channels, program titles are generally truncated to fit into the cells of the grid. The width of a grid cell varies with the program duration. Since a 30 minute program is allotted only a small space for the program title and description, titles and/or descriptions for half and even full hour programs often must be truncated to fit in the allotted space. Some systems simply cut off the description of a program without abbreviating it in any way, such that the user cannot determine the subject matter of the program. Although some systems

1 partially alleviate this problem by providing two lines of text in each grid cell,
2 this solution is not ideal because program descriptions may still be truncated.

3 2. Inability to Simultaneously Channel Surf and View EPG. Prior EPGs lack a
4 method for creating a viewing itinerary electronically while a user
5 concurrently views a program on the television screen. In other words, when a
6 user views a program on a particular channel, he or she cannot electronically
7 set up a sequence of other channels to surf. Moreover, these prior EPGs leave
8 much guess work for the user as he or she navigates through a sequence of
9 channels. When skimming through channels and trying to determine what
10 program is being displayed on a channel, commonly known as "channel
11 surfing," the user must guess which program is currently being aired from the
12 video segment encountered during channel surfing. Since much--in some
13 cases, up to 30%--of the programming appearing on a channel at any given
14 time is advertising, the user is not provided with any clues as to what program
15 is appearing on a selected channel at a given time. Therefore, the user must
16 wait until the advertisement or commercial ends before learning which
17 program is appearing on the selected channel. Thus, a need exists for an EPG
18 that displays current program schedule information for each channel at the
19 same time that the user surfs through the channels.

20 3. Text Size. Unfortunately, current EPGs allow for only one font size.

21 However, human beings do not all have the same acuity of vision. Therefore,
22 some viewers may be unable to read the information in the EPG.

23 4. Specular Highlighting. Existing EPGs provide only a very rudimentary
24 lighting capability. In other words, existing EPGs do not have a very

sophisticated ability to adjust the brightness of the EPG. This detracts from the utility of the EPG.

Summary

An EPG in accordance with one embodiment of the invention comprises a set of pictograms containing information identifying programs being shown on a set of video channels. The pictograms comprise non-alphanumeric symbols to assist a viewer in determining what is being shown, even if the various options displayed in the EPG are too small for normal alphanumeric characters to be used. In one embodiment, the pictograms contain one or more colors that assist the viewer in recognizing the pictogram and thereby determining what programs are being shown. In one embodiment, the EPG includes both pictograms and text (alphanumeric symbols) to indicate what programs are being shown.

In one embodiment, the EPG is shown in a window region within a television screen while the other portion of the screen displays a television program. Thus, a viewer can view a program broadcast on a television channel and the EPG simultaneously. The viewer can determine what program is on the channel he is watching, even if the viewer turns to that channel while a commercial is being shown. Further, the viewer can identify other programs and select them by clicking on various icons or pictograms in the EPG. Thus, the viewer can easily select channels showing other desirable programs while the television is tuned to another program.

As mentioned above, the EPG uses pictograms. These pictograms can be distinctive in shape and color. Thus, even if the EPG is "shrunk" to fit in a relatively

1 small window within the TV viewing screen, a viewer can still determine from the
2 EPG which programs are of interest, and which programs are not of interest.

3 In one embodiment, the EPG permits a user to "zoom" in on, or otherwise
4 visually expand portions of, the EPG program listing. Thus, the viewer can identify
5 those parts of the EPG showing programs of interest.

6 In one embodiment, the EPG and EPG pictograms are generated using a 3D
7 graphics pipeline. The EPG comprises a set of textured geometric surfaces that form
8 the pictograms as well as alphanumeric text data. (The geometric surfaces textured to
9 form pictograms and alphanumeric data are called "data surfaces".) The EPG also
10 comprises a set of "video surfaces," i.e. geometric surfaces textured with video
11 images from television programs, previews of television programs, or video data
12 stored in a memory such as a hard disk drive. The geometric surfaces, including both
13 data surfaces and video surfaces, can be arbitrarily positioned in virtual 3D space to
14 provide data and video information. For example, the video surfaces can be
15 positioned in one part of a television screen and the data surfaces can be positioned an
16 another part.

17 In one embodiment, display of the EPG surfaces can be modified in response
18 to certain events, e.g. a remote controller button being pushed. For example, when a
19 control button on a remote controller is actuated to select one of the pictograms, the
20 EPG can highlight the selected pictogram, or alter a video surface showing a program
21 preview. This alteration of the video surface can be in the form of zooming in on the
22 video surface by changing its position in virtual 3D space or changing the color of the
23 video surface by changing specular, ambient, and directional lighting. In one
24 embodiment, the EPG can alter a data surface by changing the texture applied to that

1 surface, changing the lighting applied to that surface, or moving the surface in virtual
2 3D space. By altering the various video and data surfaces, the surfaces (including
3 pictograms) can be observed from different perspectives, (i.e. from different "virtual
4 locations"). This facilitates a viewer zooming in on the various pictograms to better
5 identify what kind of program they represent.

6 In one embodiment, the EPG includes icons or pictograms related to other
7 items of interest, e.g. icons or pictograms that can be clicked on for pay-per-view
8 events. Thus, a viewer can click on a pictogram to watch a pay-per-view boxing
9 match, movie, concert, or other event.

10 In another embodiment, icons or pictograms are included in the EPG
11 corresponding to different types of merchandise or services. A user can click on these
12 pictograms to obtain information concerning these goods and services, and order them
13 using the EPG.

14 In one embodiment, the EPG provides user assistance. This user assistance
15 can be in the form of prompts that are displayed if the viewer presses an inappropriate
16 control button. In another embodiment, the EPG indicates to the viewer what controls
17 are appropriate to actuate in a given situation.

18 In one embodiment, the font size (and the pictogram size) of the EPG image
19 can be adjusted by the user, as can the lighting and colors of the EPG display.

20 These and other features of the invention are described in greater detail below.

22 **Brief Description of the Drawings**

23 Fig. 1 illustrates an EPG display in accordance with the prior art.

24 Fig. 2 illustrates an EPG display in accordance with the present invention.

1 Fig. 2A illustrates an EPG display including a set of columns indicating what
2 is being shown on television during various time periods.

3 Fig. 2B illustrates an EPG displayed in a window region within a television
4 screen.

5 Fig. 2C illustrates an EPG display comprising a region for showing thumbnail
6 displays of different programs.

7 Fig. 2C' illustrates an EPG using faces of a polyhedron to show thumbnail
8 displays of different programs.

9 Fig. 2D illustrates an EPG displaying a window indicating which remote
10 controller keys can be pushed.

11 Fig. 3 illustrates a television screen displaying information concerning
12 products that can be purchased using the EPG.

13 Fig. 4 illustrates a set of polygons depicting the surface of a pictogram object
14 to be displayed on a television screen as one of the symbols that constitute part of the
15 EPG.

16 Fig. 5 schematically illustrates 3D aspects of the images displayed in the EPG.
17 Fig. 5 also shows the manner in which an EPG in accordance with the present
18 invention can be viewed concurrently with a television program.

19 Fig. 5A illustrates an EPG in which the location of a virtual object within the
20 EPG has moved to a location closer to a virtual viewer.

21 Fig. 6 is a block diagram of a television system in accordance with the present
22 invention.

23
24 **Detailed Description**

1 This invention relates to an EPG system that provides a user with schedule
2 information for broadcast programs (including cablecast, or datacast programs)
3 viewed by the user on a television or a PCTV. (A PCTV is a personal computer
4 having the capability of displaying video programs.) This invention also relates to an
5 improved EPG that uses a 3D graphics pipeline to display images, alphanumeric text
6 and video data and provides the user with a more powerful and convenient television
7 in a desktop environment, while simultaneously increasing the efficiency of
8 navigation by the user through the EPG.

9 Fig. 2 shows a television system 100 comprising a video screen 102 in
10 accordance with the invention. An EPG in accordance with the invention can be put
11 in any of several modes. In one mode, the EPG is programmed to list television
12 programs of a particular type, e.g. sports programs, movies, children's programs,
13 sitcoms, etc. In the example displayed in Fig. 2, the EPG lists sports programs. In
14 another mode (not shown), the EPG lists movies that are currently being shown on
15 television. In another mode, the EPG lists all programs, regardless of the type of
16 program, in the order of the television station number. In another mode, the EPG lists
17 programs alphabetically. A user can select the EPG mode by actuating appropriate
18 control buttons on a remote control device 150. In Fig. 2, a rectangular title bar 104
19 indicates the type of programs listed by the EPG. In particular, title bar 104 indicates
20 that the programs listed by the EPG are sports programs. The selected listings, as an
21 example only, include three columns, the first of which identifies the various
22 television stations (110, 120, etc.), the second column identifies the program (111,
23 121, etc.) and the third column identifies special activities such as merchandising
24 (112, 122, etc.).

1 Rather than displaying a matrix of rectangular boxes containing text as shown
2 in Fig. 2, 3D objects with real shapes can be displayed on screen 102 along with
3 rectangular or bar shaped text blocks. For example, display element 110 shows
4 “ABC™” in a rectangular block, while display element 120 shows Fox™ as a waving
5 flag, symbolically indicated by arrows 120a and 120b. One example of a method for
6 displaying such an image using 3D accelerator technology is discussed below.

7 Display element 121 is a baseball and bat, thereby indicating that the show in
8 question is a baseball game. Again, motion of the bat is symbolically indicated by
9 arrow 121a. Display element 111 is a text block, indicating that a program being
10 shown is a football game. It is thus seen that the EPG can use both pictograms and
11 text blocks to indicate what program is being shown. However, in other
12 embodiments, only pictograms are used. The pictograms and/or text blocks can be
13 displayed using colors that help identify what program is being shown.

14 The EPG is typically used in conjunction with a remote control device, e.g.
15 remote control device 150. Remote control device 150 can communicate with
16 television system 100 in any of a number of ways, e.g. infrared signals, radio signals,
17 or a cable connection. In one embodiment, the remote control device contains a
18 mechanism by which the user can manipulate a cursor, e.g. cursor 152 on screen 102.
19 Remote control device 150 can comprise a joystick, track ball, touch pad, mouse, a set
20 of up/down left/right buttons, lever, or other type of control mechanism. The user can
21 move cursor 152 to image 110 to select and watch the program playing on the channel
22 corresponding to image 110 (in this example, ABC). Alternatively, the user can move

1 cursor 152 to image 120 to watch the program playing on the channel corresponding
2 to image 120. Alternatively, the viewer can click on image 111 to watch the program
3 corresponding to image 111 (in this case, a NFL football game).

4 As mentioned above, remote controller 150 can use any of a number of
5 transmission techniques to communicate with television system 100. In addition,
6 remote controller 150 can be a dedicated for use with television system 100 (e.g.
7 incorporating a single command set for use with system 100), or remote controller
8 150 can be designed for use in conjunction with different types of devices in addition
9 to television system 100. In addition, remote controller 150 can be programmable so
10 that it can implement different types of command sets. (An example of a remote
11 controller having such programmable capabilities is discussed in U.S. Patent
12 4,918,439, issued to Wozniak et al.)

13 As mentioned above, the third column of images on screen 102 depicts icons
14 or pictograms relating to merchandising. Screen 102 depicts logos or pictograms
15 pertaining to merchandise that can be displayed and purchased using television
16 system 100. For example, adjacent to logo 121 indicating that a baseball game is
17 being shown on a particular station, a large baseball logo 122 appears, indicating that
18 baseball-related products can be viewed and ordered by clicking on logo 122. A user
19 can use cursor 152 to click on these logos to obtain information about the items being
20 sold. For example, a user can click on baseball 122 to access information concerning
21 merchandise that can be purchased using his or her interactive television system.

22 When the user does this, information is downloaded from an information source and
23 displayed on screen 102. This information pertains to products that can be purchased
24 from a vendor. In one embodiment, this information is downloaded from a wide area

1 network ("WAN") such as the Internet. Alternatively or concurrently, the information
2 can be provided by the broadcaster that provides the television programs to television
3 system 100. (This information can be provided on a dedicated channel.
4 Alternatively, the information can be embedded in one of the blanking periods of the
5 television signal, or embedded by any other suitable method compatible with the
6 relevant analog and/or digital broadcast and encryption standards.) When the user
7 clicks on baseball 122, information such as a web page is displayed on screen 102,
8 listing various items that can be purchased, e.g. baseballs, bats, gloves, baseball cards,
9 beer mugs, team banners, etc. For example, a page such as that shown in Fig. 3 can
10 be displayed, illustrating the various items 161 to 165 that can be purchased,
11 information in text blocks 166 to 170 concerning those items, and boxes 171 to 175
12 indicating the price of those objects. In one embodiment, the user can move cursor
13 152 to a picture of one of the items and click on that item to purchase it. (There are
14 different control elements known for moving cursors including but not limited to such
15 as mice, trackballs, gloves, keys, touchpads, joysticks etc. One or more of these
16 control elements can be used to move cursor 152. As mentioned above, one or more
17 of these control elements are typically incorporated in remote controller 150 for this
18 purpose.) When a user clicks on one of items 161-165, a signal is communicated to
19 the cable broadcast system, and the purchaser's order is processed. This can be
20 accomplished using hardware similar to that discussed in U.S. Patent Application
21 09/449,016, filed by Kamen et al. on November 24, 1999 or PCT Patent Application
22 No. PCT/US00/31195, filed November 13, 2000 (docket no. isurfTV11), incorporated
23 herein by reference.

1 Television networks or cable or satellite system operators may display logos
2 or alternatively, a combination of indicative icons and corporate logos on EPG screen
3 102. For example, if a baseball game is played in 3Com park in San Francisco, 3Com
4 Corporation, for an additional fee, can have its logo inserted on screen 102 in lieu of
5 or along with baseball and bat pictogram 121. Alternatively, in lieu of or along with
6 baseball and bat pictogram 121, screen 102 may display logos of the teams playing.
7 These logos can appear alone or placed on or adjacent to an image of a baseball to
8 highlight the fact that the program in question is a baseball game. Numerous other
9 combinations can also be displayed on screen 102.

10 Stations can use special logos or pictograms to be displayed by the EPG for
11 their show categories, such as a magnifying glass for mysteries (or, alternatively a
12 handgun), a smiling face for sitcoms, a guitar for music videos, etc. These logos or
13 pictograms facilitate recognizing a show.

14 In some embodiments, the EPG grid can display text blocks and pictograms
15 corresponding to some programs. Accordingly, screen 102 can get crowded.
16 However, it will remain easy to recognize the shows by the shape and/or motion of
17 the displayed pictograms, especially compared with the rectangular text blocks used
18 in current EPGs. Further, if the pictograms on screen 102 use different colors
19 (particularly unique colors), this further enhances readability of an EPG in accordance
20 with the present invention compared with currently existing EPGs.

21 In one embodiment, the text blocks appearing in the EPG, if any, can also
22 have unique colors and or fonts, which make it easier to recognize them as well.

23 In one embodiment, the user can program the EPG to modify the color and
24 brightness of the different pictograms and text blocks, or to assign different color

1 schemes to the pictograms or text blocks. Thus, a user might have all comedy-related
2 pictograms or text blocks color-coded as bright blue, and all dramas are color coded
3 as bright red. This further enhances the ability of the user to use the EPG to select
4 desired programs with great ease. In particular, program types may be recognized,
5 even if the text is too small to read. (The EPG typically receives information from the
6 broadcaster indicating the types of programs being broadcast. The EPG can then
7 display the program information in the appropriate color. This information can be
8 received as part of the cable broadcast signal, or can be received from another source,
9 e.g. a LAN or WAN.) The color of the various pictograms and text blocks can be
10 modified by controlling the color of a "virtual lighting source" (described below) that
11 is used to generate the image. Alternatively, the color of texture pixels used to
12 generate the image can be modified. (As explained below, the various text blocks and
13 pictograms are generated using a 3D graphics pipeline. This pipeline generates
14 images by applying texture maps to one or more geometric surfaces, and applying a
15 virtual light source to the textured surface or surfaces. The process by which this is
16 done is described below.)

17 In one embodiment, the EPG pictograms and text blocks are scaled in the x
18 and y directions to show expected run times. Alternatively, in another embodiment,
19 the EPG pictograms and text blocks are scaled in the x and y directions to show their
20 importance or rating on a scale, to which the viewer can subscribe. For example, in
21 one embodiment, the user can subscribe to a movie rating service that rates the quality
22 of movies. Information from the rating service can either be entered into the EPG
23 system by the user, or by the cable system broadcaster. Exceptionally good films can

1 be highlighted, e.g. by expanding the text block or pictogram associated with those
2 films.

3 Similarly, the EPG can be programmed with information indicative of a user's
4 tastes. Thus, if the system is programmed with information indicating that the user
5 particularly enjoys sports programs, the EPG will highlight or expand those text
6 blocks and pictograms corresponding to sporting events. Similarly, if the system has
7 been programmed to indicate that the user prefers educational television, the EPG will
8 highlight or expand those text blocks and pictograms corresponding to educational
9 programs.

10 Fig. 2 illustrates an EPG display screen with three columns. In other
11 embodiments, the EPG comprises more than three columns. For example, as shown
12 in Fig. 2A, a first column 190 lists program channels, a second column 191 depicts
13 programs currently playing, a column 192 depicts programs playing in the next half-
14 hour, and a fourth column 193 depicts programs playing in the half hour after that. In
15 Fig. 2A, baseball bat 121 spans columns 191 and 192, thereby indicating that the
16 baseball game is expected to continue into the time slot corresponding to column 192.
17 However, text block 111 does not extend through into column 192. This indicates
18 that the football game is not expected to extend into the time slot corresponding to
19 column 192. As can be seen, a pictogram 194 indicates that after the football game,
20 ABC will be showing a horse race.

21 EPG Window Region

22 As mentioned above, frequently a viewer will want to channel surf while
23 being able to determine what program he or she has just turned to. If a commercial is
24

1 playing, the viewer has no way of knowing what program is on. In one embodiment,
2 the viewer can press a control button on remote controller 150 that causes a window
3 103a to open on screen 102 Fig. 2B). The EPG is displayed within window 103a.
4 Thus, a user can channel surf and watch programs on portion 103b of screen 102,
5 while simultaneously seeing an identification of the program that he or she is
6 currently watching. This is particularly useful if a commercial is playing. In addition,
7 the user can see what is playing on other channels, and he or she can click on
8 pictograms or text blocks corresponding to those other channels (or pictograms or text
9 blocks corresponding to the programs being shown on those other channels) to change
10 the channel of the television system. This represents a major improvement over prior
11 art EPGs, which typically take up an entire television screen. Thus, these prior art
12 EPGs do not permit a user to simultaneously watch one channel while investigating
13 what is on other channels.

15 EPG Embodiment Displaying Magnified Segments

16 In one embodiment, it may be desirable to permit a user to magnify portions of
17 the EPG so that the user can get a better view of what is being displayed.
18 Accordingly, remote controller 150 contains a button 196 that permits the user to
19 expand a selected portion of the EPG display. This is schematically shown by a bar
20 130 that extends into a region 131 of screen 102. As can be seen, the portion of bar
21 130 extending into region 131 is magnified, so the viewer can more easily see what
22 bar 130 represents. A user can control which portions of the EPG display are
23 magnified by pressing button 196 and moving cursor 152 to a portion of the display
24 that the viewer wants magnified.

EPG Embodiment Displaying 3D Images

In one embodiment, the graphics circuitry that provides the information displayed on screen 102 stores the image elements in a 3D model and generates the image using a 3D accelerator. This is done in a manner similar to that described in our PCT patent application WO 00/46754 (corresponding to U.S. Patent Application 09/344,442, docket No. isurfTV1) and WO 00/46753 (corresponding to U.S. Patent Application 09/361,470, docket No. isurfTV2). (These PCT Applications describe 3D accelerator technology and are incorporated herein by reference.) Briefly, this is accomplished by a) storing a computer model of a geometric surface of one or more pictograms in a first set of memory locations within the television STB; b) storing within a second set of memory locations a two dimensional image to be mapped onto that surface (e.g. a pixel array); and c) constructing a pixel array comprising image 121. For example, image 121 is typically generated in the following manner.

1. A computer model describing the object depicted by image 120 is received from a source such as the broadcaster or some other source and stored in one or more memory devices within the STB. The computer model is typically in terms of a) a set of geometric surfaces; and b) pixel data that is to be applied, or "bound" to those surfaces. The geometric surfaces can be defined in terms of a set of polygons, e.g. triangles. Each polygon is defined in terms of the x, y, z coordinates of its vertices. Alternatively, these surfaces can be defined in terms of a mathematical formula (i.e. "implicitly defined"). Fig. 4 schematically illustrates the polygons used to model the shape of the object depicted by image 121. Fig. 4 has the appearance of a wire frame model of

1 polygons that show the shape of the surface and three-dimensional features (if
2 any) of the object depicted by image 121. This wire frame model is not shown
3 on screen 102, per se. Rather, Fig. 4 is merely provided to schematically
4 indicate what kind of information is contained in the memory file that
5 describes the geometric surfaces. Further information concerning the process
6 of constructing a mesh of polygons is described in standard graphics libraries,
7 such as Real 3D, published by Real 3D, a Lockheed Martin Corporation in
8 1996, and Direct 3D, published by New Riders Publishing in 1997, each of
9 which is incorporated herein by reference. The pixel data (contained in
10 another memory file) includes information corresponding to colors and
11 patterns to be applied to the polygons of Fig. 4. In the case of image 121, this
12 would include a pixel array illustrating the appearance of wood, i.e. the wood
13 finish of a baseball bat, the appearance of the baseball, and the letters "MLB".

14 2. The pixel array data is then "bound" to the mesh of polygons. This is
15 accomplished by mapping polygon vertices to a location in the pixel array.
16 This portion of the process is roughly analogous to an upholsterer choosing a
17 piece of fabric, and binding it with a few nails to the corner of a couch being
18 upholstered. The upholsterer subsequently asks his apprentice to finishing
19 attaching the fabric to the couch. In this case, the 3D graphics accelerator
20 finishes the task instead of an apprentice.

21 3. Thereafter, information is communicated to the 3D graphics accelerator within
22 the STB identifying the location of a "virtual viewer." In other words,
23 information is communicated to a 3D graphics accelerator identifying a point
24 of reference P (Fig. 4) from which the object of image 121 is to be observed.

1 Usually, point of reference P is a "default" position, and is simply some
2 distance in front of the baseball bat. However, as explained below, a user can
3 change the position P of this virtual viewer, e.g. with remote control device
4 150.

5 4. Information concerning a virtual lighting source is also communicated to the
6 3D graphics accelerator. This information can include a) the color of the light
7 being provided by the lighting source; b) the brightness of this virtual lighting
8 source; and c) whether the lighting source is diffuse or specular.

9 5. Thereafter, the 3D graphics accelerator within the STB generates image 121
10 (typically in the form of a pixel array) of the baseball bat as that baseball bat
11 would be perceived by a virtual viewer if the virtual viewer were located at
12 point P and the baseball bat were illuminated with the selected lighting source.
13 The other pictograms, text blocks and images shown in Fig. 2 can be similarly
14 generated. (As explained below, video programs and video clips can be bound
15 to geometric surfaces for display on screen 102 as part of the EPG in a similar
16 manner.)

17 As mentioned above, more details concerning the basic process of generating 3D
18 images are discussed in the above-incorporated WO 00/46754 and WO 00/46753
19 applications. Also see Foley et al., "Computer Graphics" published by Addison-
20 Wesley in 1996, incorporated herein by reference.

21 The fact that the various pictograms are generated in the above-described
22 manner has a special significance for an EPG in accordance with the invention. In
23 particular, the EPG maintains the various pictograms and blocks of the display in the
24 form of a 3D object model. Thus, a user can "zoom" toward or away from the various

1 pictograms of the EPG to make it easier to see what programs are being displayed.
2 This is accomplished by pressing appropriate control buttons on remote controller 150
3 and causing the 3D graphics accelerator to regenerate the EPG images from a
4 different reference point, e.g. a reference point closer to the baseball and bat. Thus,
5 image 121 of the baseball and bat will appear larger on screen 102.

6 The 3D aspects of the EPG are schematically shown in Fig. 5. Referring to
7 Fig. 5, screen 102 is displaying a television program, but window 103 within screen
8 102 displays the EPG information. Since the EPG information is confined to window
9 103, it is somewhat shrunk. The image of the various icons and pictograms of the
10 EPG are generated using a 3D graphics accelerator, and are displayed as if a virtual
11 viewer were watching these icons and pictograms from a particular distance. A
12 viewer can "zoom" toward the pictograms to get a closer view of them by adjusting
13 an appropriate control element on remote controller 150 (e.g. a touch pad, mouse,
14 joystick, track ball, etc.). In this way, the user can take a closer look at the
15 pictograms.

16 Also, since the images of the pictogram objects are generated from a computer
17 model such that each object is at different virtual location in space, a viewer may "fly"
18 his virtual camera position close up to an object, and thus be able to see more details.

19 As can be seen in Fig. 5, image 121 is roughly a virtual distance D1 from the
20 planar background portion 155 of the EPG. Text blocks 110 and 111 are a virtual
21 distance D2 from planar background portion 155 of the EPG, whereas baseball 121a
22 and bat 121 are a virtual distance D2 from planar background portion 155. By
23 manipulating the position of the virtual viewer, located at point P, the virtual viewer
24 can "fly" or "zoom in" on the various portions of the EPG, e.g. by moving the

1 location of the virtual viewer to a point P'. (Of course, the actual viewer doesn't need
2 to move. Rather, the graphics accelerator within television system 100 reconstructs
3 the EPG image on screen 102 as that image would be seen by a virtual observer
4 moving from point P to P'.)

5 In one embodiment, in lieu of, or in addition to moving the position of virtual
6 viewer P, one can also move the location of the objects displayed in the EPG. For
7 example, in one embodiment, a user can click on object 121 (the baseball bat). The
8 EPG can respond by reconstructing the image of the baseball bat on a geometric
9 surface located a distance D3 from plane 155 (Fig. 5A). This creates the visual
10 impression of having the baseball bat 121 move closer to the television viewer so he
11 has a better view of what he has just clicked on and selected. The viewer can then
12 confirm his selection by clicking, once again, on baseball bat 121.

13 Just as the location of pictograms can be changed by clicking on them, the
14 location in virtual 3D space of text blocks can also be changed in the same manner.
15 (As mentioned above, the text blocks are can be mapped onto geometric surfaces in
16 the same manner as the various pictograms.)

17 Referring back to Fig. 4, in one embodiment, the polygon mesh in the shape of
18 the baseball and bat can be a two-dimensional polygon mesh. In other words, all of
19 the polygon vertices are coplanar (i.e. the polygon mesh is flat) and all of the vertices
20 have the same z dimension. The mesh has the outline of a baseball and bat when
21 viewed from a direction perpendicular to the plane of the mesh. (When the vertices
22 have the same z dimension, all of the vertices are the same distance from a virtual
23 plane 155. Virtual plane 155 is the plane of the EPG background.) Arranging the
24 polygon vertices so that they are all coplanar has the advantage that any text mapped

1 onto the polygons using the 3D accelerator (e.g. the letters "MLB" in Fig. 2) is easily
2 read. However, in another embodiment, the polygons are not all coplanar, and in fact,
3 can actually be a 3 dimensional model of a baseball and bat. On other words, the
4 polygons are not flat in this other embodiment. The polygons collectively form the
5 shape of a baseball and bat in three dimensions. (The ball is spherical and the bat is
6 roughly cylindrical.) In this embodiment, the polygon vertices have different z
7 values.

8 9 Help Mode

10 An EPG in accordance with one embodiment of the invention can include
11 several features that enhance user friendliness. For example, in one embodiment, the
12 EPG provides an indication of which buttons on the remote controller can be actuated
13 in a given situation. In another embodiment, the remote controller contains a light
14 emitting diode (LED) or other indicator, and if a user presses an inappropriate button
15 on the remote controller, the LED illuminates, thereby informing the user that he or
16 she is doing something improper. (In this embodiment, the CPU within video system
17 100 typically sends a signal to remote controller 150. Alternatively, in this
18 embodiment, a microprocessor within the controller itself determines when an
19 inappropriate button is being pressed.)

20 In yet another embodiment, the various control buttons of the remote
21 controller contain or are associated with LEDs or other indicators (e.g. liquid crystal
22 displays (LCDs) in conjunction with a touch screen etc.). The LEDs corresponding to
23 those buttons that can be pressed in a given situation illuminate, thereby informing the
24 viewer which buttons he or she can press in a given situation.

1 In yet another embodiment, the EPG may include a window on screen 102
2 (not shown) that indicates to the user which buttons would be appropriate to actuate in
3 a certain situation.

4 In yet another embodiment, the EPG displays user assistance information on
5 screen 102 if the user tries to actuate an inappropriate button on remote controller
6 150.

7 In yet another embodiment, the remote controller contains a "help" key. If the
8 user presses the help key, screen 102 provides a window 500 showing an image 502
9 of remote controller 150, and indicating which keys can be pressed in a given
10 situation (Fig. 2D). (The keys that can be pushed, e.g. keys 504, 506 and 508) are
11 highlighted.

12 By indicating to the user which keys can be pressed in a given situation, user
13 friendliness of an EPG in accordance with the invention is enhanced.

14 In one embodiment, the EPG provides automated assistance to a user. This
15 can be provided in several ways. For example, as mentioned above, the EPG can
16 indicate to the user which remote control keys can be used in a situation. Additional
17 information on their respective functions may also be provided. In another
18 embodiment, the EPG includes a question mark icon 510 (Fig. 2A and 2D). The user
19 can click on this icon, to obtain help information. Alternatively, the user can click on
20 question mark icon 510 and drag it to a pictogram on screen 102 to obtain information
21 about what that pictogram does.

22 In one embodiment, one of the buttons on remote controller 150 is a "help"
23 button that causes the EPG to depict on screen 102 a help menu. The EPG may

1 suggest various "help" options by highlighting appropriate options to better guide the
2 user.

3
4 Description of the Hardware Within the STB

5 Referring to Fig. 6, the hardware used by the receiver to practice the invention
6 typically comprises a) a CPU 300 (e.g. a Celeron or Pentium, manufactured by Intel
7 Corporation, or any other equivalent CPU) coupled to a) a program memory 302
8 (typically a ROM, EPROM, EEPROM, EAROM, hard disk, CD ROM, or other
9 memory device); b) a second memory device 304 (e.g. a RAM or magnetic disk); and
10 c) a graphics accelerator circuit 306. Program memory 302 contains the program
11 instructions executed by CPU 300. Memory 304 can comprise one or more memory
12 devices. In one embodiment, memory 304 contains a) a portion 304a containing
13 information concerning the polygons used to construct images of objects; and b) a
14 portion 304b containing pixel information to be applied, or bound, to the polygons.
15 Graphics accelerator 306 accesses the information contained in memory 304 and
16 constructs an image in a pixel array memory 308. Information from pixel array
17 memory 308 is provided to video electronics circuit 310 for display on video display
18 screen 102.

19 Also shown in Fig. 6 is remote control device 150, which is manipulated by a
20 user as described above. Remote control device 150 provides signals (typically
21 communicated via infra red communication (or any other method as previously
22 described) shown as dotted line arrow 311) to a transducer 312 that is coupled to CPU
23 300. CPU 300 reads the signals provided by remote control device 150, and controls
24 the images displayed on video screen 102 in response thereto. Also, many small

1 differences can be made in the "architecture" of connecting the remote control base
2 unit (e.g. the transceiver that receives signals from remote controller 150). In some
3 cases this architecture may mimic a parallel or serial port, and in other cases it may
4 mimic a mouse and or a keyboard. This is advantageous, since it allows remote
5 controller 150 to send commands directly to system 100, without requiring special
6 driver software.

7 Also shown in Fig. 6 is a network I/O circuit 313. Network I/O circuit 313
8 can be any of numerous different types of circuits, e.g. a modem for communicating
9 with the internet, or an interface circuit for communicating with other LAN or WAN
10 networks. As mentioned above, by clicking on icon or pictogram 122, a user can
11 obtain data concerning items that can be purchased from different vendors. In one
12 embodiment, when a user clicks on one of these icons, a signal is communicated to a
13 server coupled to the LAN or WAN network, and that server communicates via
14 network circuit 313 back to CPU 300 information to be displayed on screen 102
15 concerning merchandise that can be ordered from that vendor. This information can
16 be in the form of a web page, for example. Network circuit 313 can also be used to
17 order pay-per-view items via a LAN or WAN.

18 Also shown in Fig. 6 is a television input circuit 316. Circuit 316 receives a
19 video signal from a source 317, e.g. a television antenna, an electrical or optical cable
20 system, a satellite system, or any other appropriate video signal source. This signal is
21 communicated to video electronics 310 for display on screen 102.

22 In one embodiment, the EPG can receive information and commands by a
23 keyboard 318 that is electrically coupled to CPU 300. Keyboard 318 can be an
24 alphanumeric keyboard, e.g. a qwerty keyboard. However, other types of keyboards

1 can be used in conjunction with the EPG. Keyboard 318 provides additional
2 flexibility for a user controlling the EPG.

3
4 Other Programmable Options

5 In one embodiment, the EPG can be programmed to provide to the user a
6 reminder when certain programs of interest are going to be on. This can be
7 accomplished using remote controller 150, clicking on a selected program pictogram,
8 and pressing a control button on the remote controller that instructs CPU 300 to
9 display a prompt on screen 102 shortly before that program is to be broadcast.

10 Alternatively, remote controller 150 can have a numeric keyboard or a more
11 complicated input control console for purposes of entering such information into the
12 EPG. Alternatively, keyboard 318 can be used to enter this information.

13 In one embodiment, a user can modify the format in which the EPG
14 information is to be displayed. For example, the user can adjust the size of the text
15 (e.g. the font size) of the information displayed by the EPG. Thus, viewers with poor
16 vision will be better able to read the information displayed by the EPG. Viewers with
17 good vision can shrink the text size so that more information can be displayed on the
18 screen by the EPG. This can be accomplished by using remote controller 150 to cause
19 CPU 300 to display an appropriate menu of control options on screen 102. The user
20 can then click on the displayed options to enter a text font size into the EPG. (The
21 text font size is typically stored within a memory in the EPG, e.g. within memory
22 304.) Rather than clicking on text font size options, text font size information can be
23 entered into the EPG using keyboard 318.

1 There is a number of ways one can enter mode information into the EPG. For
2 example, remote controller 150 can have a mode button. When the mode button is
3 pressed, a list of programmable menu options appears on screen 102, and the user can
4 click on a desired option. Alternatively, the EPG can have a menu icon, and the user
5 can click on the menu icon. Alternatively, there can be a menu button on video
6 system 100 itself that a user can push. Other techniques can be used to communicate
7 programmable option choices to the EPG.

9 EPG With Reduced Size Program Displays

10 In another embodiment, portions of the EPG can be used to display reduced
11 size (for example, thumbnail) versions of programs appearing on various channels,
12 thereby permitting a viewer to preview programs. For example, optionally, a portion
13 320 of screen 102 (Fig. 2C) can depict a thumbnail display of what is playing on one
14 of the channels. In another embodiment, portion 320 of screen 102 can depict a set of
15 reduced size displays (e.g. in portions 320a, 320b, and 320c of portion 320 of screen
16 102) so that a viewer can see what is showing on different channels. In an alternative
17 embodiment, the reduced size displays can be mapped into geometric surfaces, e.g. of
18 a polyhedron (e.g. a cube) as described in PCT Patent Application WO 00/46680,
19 corresponding to U.S. Patent Application Serial No. 09/378,184, filed 8/20/99 by
20 Kamen et al. (attorney docket no. isurfTV4), and U.S. Patent Application 09/378,220,
21 filed 8/20/99 by Kamen et al. (attorney docket no. isurfTV4A). The WO 00/46680,
22 '184 and '220 Applications are incorporated herein by reference.

23 The WO 00/46680, '184 and '220 Applications teach mapping (or binding)
24 video images onto geometric surfaces using 3D accelerator technology. A 3D

1 graphics accelerator generates a pixel array corresponding to these images as bound
2 onto the geometric surfaces. By altering the position of a "virtual viewer", or by
3 altering the shape or angle of the geometric surface, one can create an appearance
4 similar to projecting a movie onto a surface having a particular shape, or held at a
5 particular angle. The WO 00/46680, '184 and '220 applications teach, among other
6 things, that one can display a polyhedron (e.g. a cube), with different video images
7 appearing on the various faces of the cube. One can alter the orientation of the
8 polyhedron using the remote controller so that different polyhedron faces are exposed.
9 In one embodiment of the invention, programs from different channels are mapped
10 onto different faces of a polyhedron (e.g. faces 560, 561 and 562 of an octahedron 563
11 in Fig. 2C'). A viewer can rotate octahedron 563 to obtain a thumbnail display of
12 what is playing on the various channels. (For such an embodiment, it is typically
13 desirable to include a video capture card within system 100 for downloading the video
14 signals into a pixel memory so that graphics accelerator 306 can map these pixels onto
15 the various geometric surfaces of polyhedron 563.)

16 The location and angle of the geometric surface upon which video clips are
17 mapped can be modified by the EPG. For example, by clicking on a reduced size
18 video image, the user can cause the EPG to move the image closer to the virtual
19 viewer (i.e. enlarge the portion of the screen showing the video image.)
20

21 EPG Operating as Shell or Window For Other Applications

22 In one embodiment, the EPG system provides a reliable and efficient method
23 of updating or replacing the application software that implements the electronic guide
24 at the user sites. This can be accomplished by downloading such software either from

1 the cable broadcaster (e.g. from source 317 using input circuitry 316), or via a WAN
2 or LAN, e.g. using network I/O circuit 313 (Fig. 6). The EPG software can be
3 designed in modules. For example, one module is optionally a graphics user interface
4 (GUI) module, whereas another module can handle the different display icons.
5 Another module can handle 3D graphics generation, and another module can be a
6 master program module. These modules can be downloaded into program memory
7 302. EPG updates can be provided either automatically or in response to a prompt
8 from the user using remote controller 150.

9 In an embodiment which permits the automated updating of software, the
10 program memory 302 should contain a programmable segment (e.g. a RAM,
11 EEPROM, EAROM, magnetic memory or magneto-optic memory) to accommodate
12 the loading of data.

13 In one embodiment, the EPG operates as a shell or window to enable a user to
14 access other applications or information systems that are not part of the EPG
15 application or data. For example, in one embodiment, when using the EPG, one can
16 press a button on the remote controller, or click on an icon within the EPG to active
17 Internet server software (e.g. Netscape software Internet Explorer software, or other
18 web surfing software package). (Such software can be stored within program
19 memory 302.) In this embodiment, the information provided by the web and the web
20 surfing software package is bound to a flat geometric surface and displayed on screen
21 102. The viewer can then use the screen to browse the Internet as if he or she were
22 logged onto a PC. (In such an embodiment, it is typically desirable to couple
23 alphanumeric keyboard 318 or other alphanumeric input device to video system 100
24 so that the user can enter key words for searching or type URLs into system 100. In

1 this embodiment, system 100 communicates with a proxy server or other ISP via
2 network I/O circuit 313 (Fig. 6).

3 The options and features described above can be combined to provide a 3D
4 enhanced EPG that allows user friendliness and interactivity not known in current
5 EPG systems. However, these options and features can be practiced independently.
6 Further, different combinations of these options and features can be practiced in an
7 EPG.

8 While the invention has been described with respect to specific embodiments,
9 those skilled in the art will appreciate that changes can be made in form and detail
10 without departing from the spirit and scope of the invention. For example, an EPG in
11 accordance with the present invention can be displayed on CRT, LCD, projection, or
12 other types of display systems. The EPG can be displayed on a television, personal
13 computer, or a device that is a combination television/personal computer. The EPG
14 can be used in conjunction with video signals that are provided by electrical or optical
15 cable, radio wave broadcast, satellite broadcast, or other types of video signal
16 transmission. The information displayed in the EPG can originate from any of
17 numerous sources, e.g. provided via electrical or optical cable, radio waves, satellite
18 broadcast, or a wide area network (for example, the Internet).

19 When displaying video information, the video information can be applied to a
20 geometric surface using a 3D graphics pipeline. Thus, as shown in Fig. 2B, both the
21 EPG in portion 103a of screen 102 and the television program in portion 103b can be
22 bound to geometric surfaces and displayed using a 3D graphics pipeline. (In fact, in
23 one embodiment, when watching the television program without the EPG, the

1 television program can be bound to a geometric surface and displayed as described
2 above.)

3 As explained in the above-incorporated WO 00/46754 and '442 applications,
4 the 3D graphics pipeline can be implemented by a combination of hardware elements,
5 known as accelerators, and software, some of which is referred to as drivers. The
6 partitioning between hardware and software may vary. Accordingly, all of these
7 modifications come within the present invention.

1 We claim:

2 1. A method for displaying programming information comprising:
3 displaying a video program on a first portion of a video display device; and
4 simultaneously displaying on a second portion of said video display device a
5 programming guide indicating what programs are playing on other channels.

6
7 2. Method of claim 1 wherein said second portion of said video display
8 device comprises a window region within said first portion of said video display
9 device.

10
11 3. Method of claim 2 wherein said video display device comprises a
12 video screen.

13
14 4. Method of claim 4 wherein said programming guide comprises
15 information in the form of pictograms, at least some of said pictograms comprising
16 color-coded information.

17
18 5. Method of claim 1 wherein said displaying of said programming guide
19 comprises using a 3D graphics pipeline to generate images of pictograms.

20
21 6. Method of claim 5 further comprising generating said images from the
22 perspective of a virtual viewer, said method further comprising manipulating the
23 position of said virtual viewer with a controller.

24

1 7. Method of claim 6 further comprising selecting another program from
2 said programming guide information and displaying said selected program on said
3 first portion of said video display device.

4
5 8. Method comprising:
6 displaying an electronic programming guide on a screen, said electronic
7 programming guide indicating what programs are being provided on various channels;
8 and
9 displaying in one or more window regions within said programming guide a
10 plurality of said programs.

11
12 9. Method comprising:
13 displaying an electronic programming guide on a screen, said programming
14 guide indicating what programs are being provided on various channels; and
15 displaying in a window region within said programming guide at least one of
16 said programs, said displaying of at least one of said programs comprising a)
17 providing a pixel array depicting said at least one of said programs; b) binding said
18 pixel array to a geometric surface; and c) generating an image of said at least one of
19 said programs based on said pixel array bound to said geometric surface.

20
21 10. Method comprising:
22 displaying an electronic programming guide on a screen, said programming
23 guide indicating what programs are being provided on various channels; and

1 displaying in a window region within said programming guide at least one of
2 said programs, said displaying of at least one of said programs comprising using a 3D
3 graphics pipeline to generate images of said at least one of said programs.

4
5 11. Method comprising:

6 generating one or more images using a 3D graphics pipeline; and
7 displaying said images as part of an electronic program guide.

8
9 12. Method of claim 11 wherein said image comprises a pictogram, said
10 pictogram identifying a channel or program within said electronic programming
11 guide.

12
13 13. Method comprising generating one or more images by a) providing a
14 model of a geometric surface; b) binding visual information from a pixel array to said
15 geometric surface; and c) generating an image on a display device corresponding to
16 said model of said geometric surface and said pixel array, said image being part of an
17 electronic programming guide.

18
19 14. Method of claim 13 wherein said image comprises a pictogram, said
20 pictogram identifying a channel or program within said electronic programming
21 guide.

22
23 15. Method for displaying television program information on a display
24 device comprising displaying a grid containing one or more pictograms, said one or

1 more pictograms corresponding to one or more television programs, said pictograms
2 indicating to a viewer what programs are being shown on different television
3 channels.

4
5 16. Method of claim 15 wherein said pictograms contain color-coded
6 information.

7
8 17. Method of claim 15 further comprising clicking on one of said
9 pictograms to select a program corresponding to said one of said pictograms.

10
11 18. Method of claim 15 wherein said grid describes a channel indication,
12 said method further comprising clicking on said channel indication to select said
13 channel.

14
15 19. Method for displaying television program information on a display
16 device comprising providing a grid containing one or more pictograms, said
17 pictograms corresponding to one or more television channels, said pictograms
18 indicating to a viewer what channel a program is being shown on.

19
20 20. Method for displaying television program information on a display
21 device comprising displaying an electronic program guide containing a grid
22 containing one or more pictograms, said one or more pictograms corresponding to
23 goods or services that can be purchased.

1 21. Method of claim 20 wherein said grid also contains an indication of
2 television channels and programs being shown on said television channels.

3
4 22. Method of claim 20 further comprising clicking on said one or more
5 pictograms to obtain information on said goods and/or services or to order said goods
6 and/or services.

7
8 23. Method comprising:
9 displaying an electronic programming guide, said electronic programming
10 guide comprising indications of channels and programs showing on said channels;
11 and
12 displaying a television program on a video screen by moving a cursor to a
13 selected one of said indications of said programs, whereby said selected one of said
14 indications of said programs can be selected by a viewer directly.

15
16 24. Method of claim 23 further comprising clicking on said selected one of
17 said indications after said moving of said cursor to said selected indication.

18
19 25. Method comprising:
20 displaying an electronic programming guide, said electronic programming
21 guide comprising indications of channels and programs showing on said channels;
22 and

1 displaying a television program on a video screen by moving a cursor to a
2 selected one of said indications of said channels, whereby said selected one of said
3 channels can be selected by a viewer directly.

4
5 26. Method of claim 25 further comprising clicking on said selected one of
6 said indications after said moving of said cursor to said selected indication.

7
8 27. Method comprising:
9 displaying programming information from an electronic programming guide
10 on a video display device; and
11 selectively magnifying portions of the information displayed on said video
12 display device.

13
14 28 Method of claim 27 wherein said video display device comprises a
15 CRT screen, and LCD screen, or a video projection screen.

16
17 29. Method of claim 28 wherein said selectively magnifying comprises
18 choosing said portions to be selectively magnified by moving a cursor to a position at
19 or adjacent to said portions to be selectively magnified.

20
21 30. Method for using an electronic programming guide, said method
22 comprising:
23 providing a CPU coupled to a memory and a video display device;

1 broadcasting from a broadcast program source video programs to be displayed
2 on said video display device; and
3 receiving electronic program guide program software instructions from an
4 external source and loading said instructions into said memory; and
5 displaying on said display device electronic program guide information,
6 whereby during said displaying, said CPU executes instructions within said memory
7 that have been received from said broadcast program source.

8
9 31. Method of claim 30 wherein said electronic program guide program
10 software instructions are embedded within a signal transmitting one of said video
11 programs

12
13 32. Method of claim 30 wherein said electronic program guide program
14 software instructions are received from a server via a network.

15
16 33. Method comprising:
17 receiving information from a viewer selecting the size of one or more image
18 elements to be displayed on a video screen as part of an electronic programming
19 guide; and
20 using said electronic programming guide to display program information, said
21 program information comprising said one or more image elements, wherein said one
22 or more image elements has said selected size.

1 34. Method of claim 33 wherein said one or more image elements are
2 pictograms.

3
4 35. Method of claim 33 wherein said one or more image elements
5 comprise text.

6
7 36. Method comprising:
8 receiving information from a viewer selecting the color of one or more image
9 elements to be displayed on a video screen as part of an electronic programming
10 guide; and
11 using said electronic programming guide to display program information, said
12 program information comprising said one or more image elements, wherein said one
13 or more image elements has said selected color.

14
15 37. Method comprising:
16 receiving information from a viewer selecting the brightness of one or more
17 image elements to be displayed on a video screen as part of an electronic
18 programming guide; and
19 using said electronic programming guide to display program information, said
20 program information comprising said one or more image elements, wherein said one
21 or more image element has said selected brightness.

22
23 38. Method comprising:

1 receiving information from a viewer selecting the brightness of at least a
2 portion of an electronic programming guide; and
3 using said electronic programming guide to display program information, at
4 least a portion of said program information being displayed at said selected
5 brightness.

6
7 39. Method comprising:
8 receiving information from a viewer selecting the color of part of an electronic
9 programming guide; and
10 using said electronic programming guide to display program information, at
11 least a portion of said program information being displayed in said selected color.

12
13 40. Apparatus comprising:
14 a screen for displaying a video program; and
15 an electronic program guide for displaying television program information on
16 a window within said screen while a video program is displayed another portion of
17 said screen outside of said window.

18
19 41. Apparatus of claim 40 wherein said electronic program guide
20 comprises an array indicating what programs are showing on a set of channels, said
21 array comprising one or more pictograms identifying one or more of said programs.

22
23 42. Apparatus comprising of claim 40 wherein said electronic program
24 guide comprises an array indicating what programs are showing on a set of channels,

1 said array comprising one or more pictograms identifying one or more of said
2 channels.

3
4 43. Apparatus comprising:
5 a video display device;
6 a receiving circuit for receiving a plurality of video programs from a video
7 program source; and
8 an electronic program guide for displaying video program schedule
9 information, said electronic program guide comprising one or more window regions
10 for displaying a plurality of said video programs simultaneously with said video
11 program schedule information.

12
13 44. Apparatus comprising:
14 a screen for displaying video programs; and
15 a video control circuit coupled to said screen, said video control circuit
16 causing said screen to display an electronic programming guide, said electronic
17 programming guide being in the form of an array, said array comprising one or more
18 pictograms for identifying one or more programs.

19
20 45. Apparatus of claim 44 wherein said pictograms are non-alphanumeric.

21
22 46. Apparatus of claim 44 further comprising a 3D graphics pipeline for
23 generating said pictograms.

1 47. Apparatus comprising:

2 a screen for displaying video programs; and

3 a video control circuit coupled to said screen, said video control circuit

4 causing said screen to display an electronic programming guide, said electronic

5 programming guide being in the form of an array, said array comprising one or more

6 pictograms for identifying one or more channels.

7
8 48. Apparatus comprising:

9 a screen for displaying video programs; and

10 a video control circuit coupled to said screen, said video control circuit

11 causing said screen to display an electronic programming guide, said electronic

12 programming guide being in the form of an array, said array comprising one or more

13 pictograms for identifying goods and services that can be ordered using said

14 electronic programming guide.

15
16 49. Apparatus comprising:

17 a video display device for displaying visual information;

18 a 3D graphics pipeline generating images of elements; and

19 a video display circuit displaying on said video display device an electronic

20 programming guide comprising images generated by said 3D graphics pipeline.

21
22 50. Apparatus comprising:

23 a memory storing pixel array information and information corresponding to

24 the shape of a geometric surface;

1 a circuit for mapping said pixel array information to said geometric surface
2 and generating an image corresponding to said pixel array information as mapped
3 onto said geometric information; and
4 a video display device displaying an electronic programming guide
5 comprising said image.
6

7 51. Apparatus comprising:

8 a display device for displaying visual information;

9 a receiving circuit for receiving video programs and displaying said video
10 programs on said display device; and

11 a circuit for providing an electronic programming guide on said display
12 device, wherein when said electronic programming guide is displayed on said display
13 device, said electronic programming guide has one or more windows for displaying a
14 plurality of said video programs.
15

16 52. Apparatus of claim 51 wherein said circuit comprises a memory for
17 storing a stream of pixel arrays corresponding to said plurality of said video
18 programs; and

19 a pipeline for mapping said pixel arrays onto geometric surfaces to generate a
20 stream of output pixel arrays, said stream of output pixel arrays being displayed on
21 said display device as part of said electronic programming guide.
22

23 53. Apparatus comprising:

1 a screen for displaying an electronic programming guide, said electronic
2 programming guide comprising a set of indicators indicating channels and a set of
3 indicators indicating what television programs are playing on said channels, said
4 screen also displaying a cursor; and
5 a controller for moving said cursor to or adjacent to one of said indicators to
6 select the channel or program corresponding to said indicator.

7
8 54. Apparatus of claim 53 wherein said controller is a remote controller
9 comprising a touch pad, a mouse, a joystick, a set of arrow buttons, or a track ball for
10 manipulating the position of said cursor.

11
12 55. Apparatus comprising:
13 a display device for displaying an electronic programming guide; and
14 a controller for identifying a portion of said electronic programming guide and
15 causing said identified portion of said electronic programming guide displayed on
16 said display device to be magnified.

17
18 56. Apparatus comprising
19 a display device for displaying an electronic programming guide, said
20 electronic programming guide comprising an array of elements communicating
21 program and channel information;
22 a memory containing information corresponding to the size of at least some of
23 said elements; and

1 a controller for modifying the information stored in said memory to control the
2 size of said at least some of said elements.

3
4 56. Apparatus comprising
5 a display device for displaying an electronic programming guide, said
6 electronic programming guide comprising an array of elements communicating
7 program and channel information;
8 a memory containing information corresponding to the color of at least part of
9 at least some of said elements; and
10 a controller for modifying the information stored in said memory to control the
11 color of said at least part of at least some of said elements.

12
13 57. Apparatus comprising
14 a display device for displaying an electronic programming guide, said
15 electronic programming guide comprising an array of elements communicating
16 program and channel information;
17 a memory containing information corresponding to the brightness of at least
18 part of at least some of said elements; and
19 a controller for modifying the information stored in said memory to control the
20 brightness of said at least part of at least some of said at least some of said elements.

21
22 58. A video system comprising:
23 a CPU;

1 a memory coupled to said CPU, said memory containing instructions to be
2 executed by said CPU;
3 a video display device, said CPU causing said video display device to display
4 an electronic programming guide; and
5 circuitry for loading software instructions into said memory from a source
6 external to said video system, whereby the instructions to be executed by said CPU
7 can be updated.

8
9 59. Apparatus of claim 58 further comprising a receiver circuit for
10 receiving video signals, said software instructions being embedded within the signals
11 received by said receiver, said software instructions received by said receiver being
12 communicated to said memory.

13
14 60. Apparatus of claim 58 further comprising a circuit for coupling said
15 video system to a network, said circuit for coupling receiving said software
16 instructions.

17
18 61. A method comprising:
19 positioning a plurality of geometric surfaces in a virtual 3D space;
20 receiving schedule information from a data source;
21 generating a set of images in response to said schedule information;
22 applying said set of images as textures to at least some of said geometric
23 surfaces;
24 receiving video data from a video data source;

1 applying said video data onto at least one of said geometric surfaces within
2 said plurality of geometric surfaces; and
3 displaying said geometric surfaces with said video data and said images
4 applied thereto.

5
6 62. Method of claim 61 wherein said video data is a video data stream
7 comprising a video program, a commercial, a preview clip, or a video clip stored on a
8 hard disk drive.

9
10 63. Method of claim 61 further comprising altering the image displayed on
11 one of said geometric surfaces in response to the actuation of a control element on a
12 remote controller.

13
14 63. Method of claim 61 further comprising receiving visual information
15 from the internet, applying said visual information as a texture to one of said
16 geometric surfaces.

17
18 64. Method of claim 63 wherein said visual information received from the
19 internet is in the form of HTML data, said method further comprising parsing said
20 HTML data and mapping visual information corresponding to said HTML data onto
21 one or more of said geometric surfaces.

22
23 65. A method comprising:

1 providing a model of one or more images in the form of a geometric surface
2 and an image bound to said geometric surface;
3 displaying said image on a visual display device, said image being part of an
4 electronic programming guide; and
5 changing the position or size of said image by changing the location, in virtual
6 space, of said geometric surface.

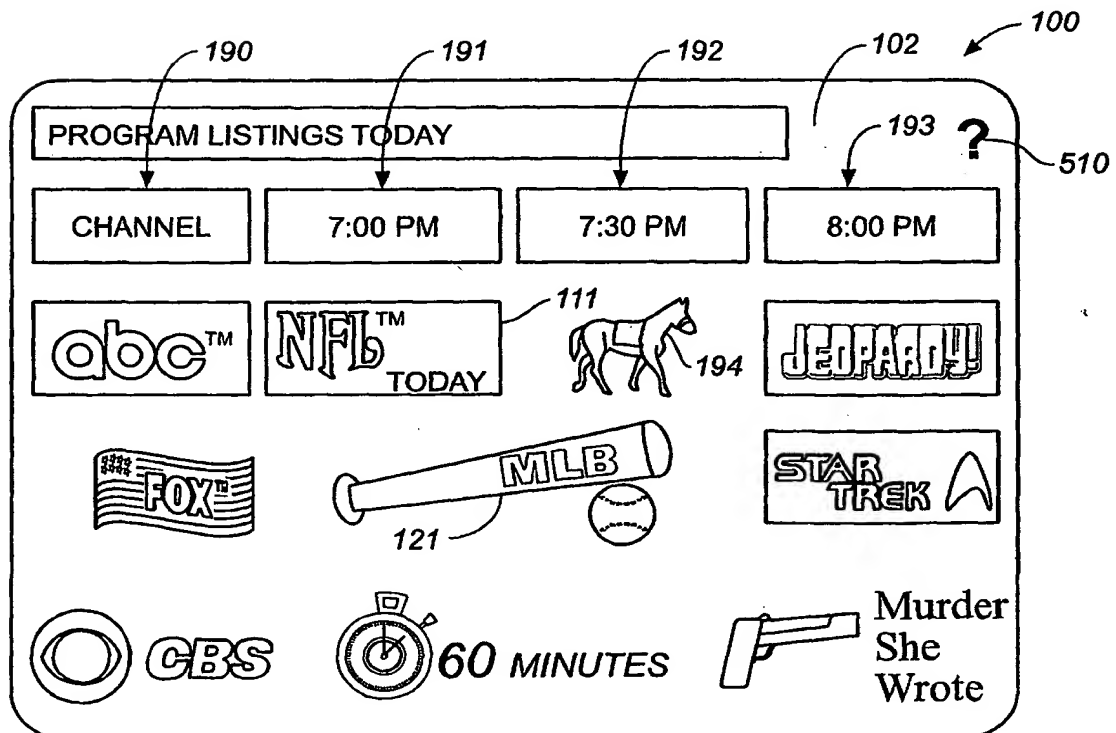
7
8 66. A method comprising:

9 providing a model of one or more images in the form of a geometric surface
10 and an image bound to said geometric surface;
11 displaying said image on a visual display device by rendering the image from
12 the perspective of a virtual viewer at a first location; and
13 changing the position or size of said image by re-rendering the image from the
14 perspective viewer at a second location.

FIG. 1
(PRIOR ART)

1 / 7

	10:00	10:30	11:00
2	--	--	--
3	--	--	--
4	--	--	--
5	--	--	--
6	--	--	--

**FIG. 2A**

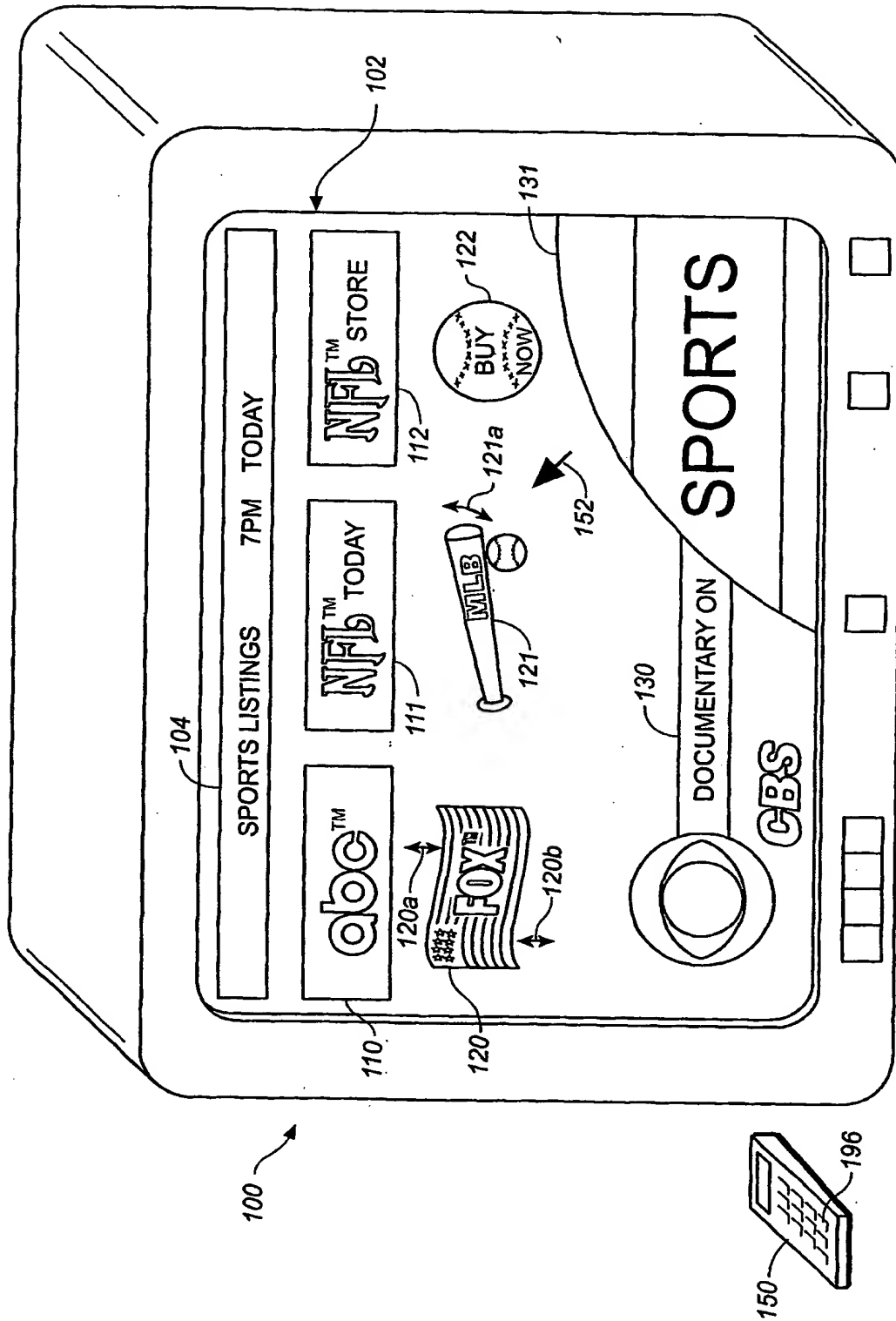
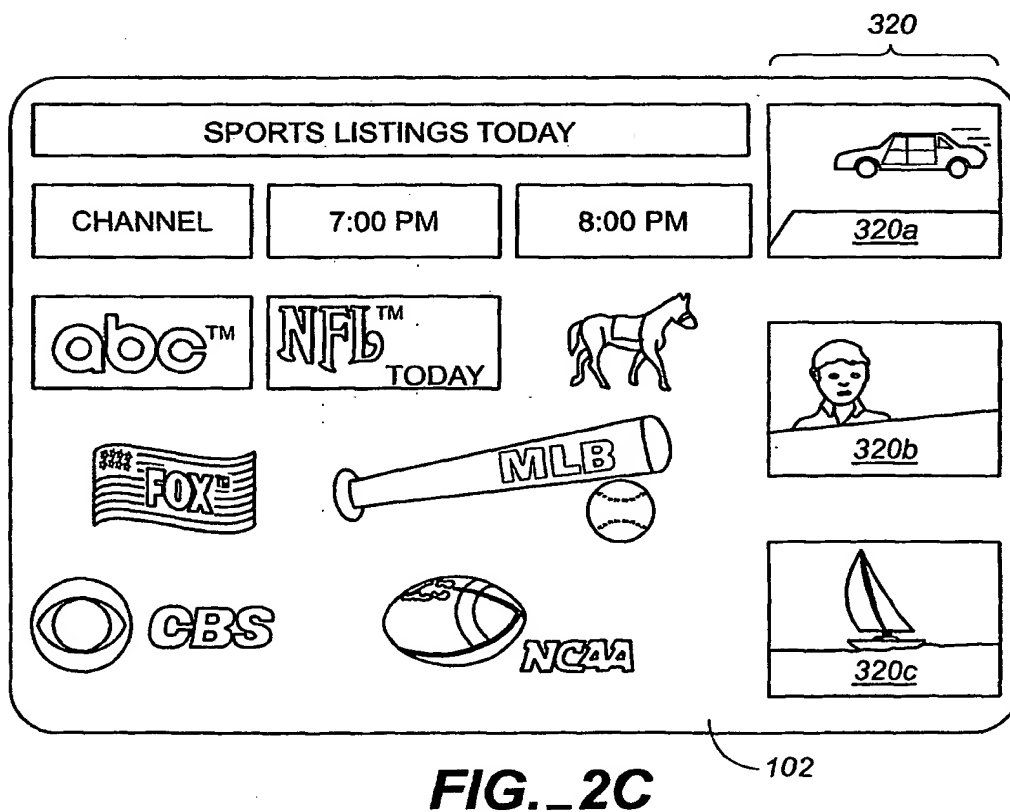
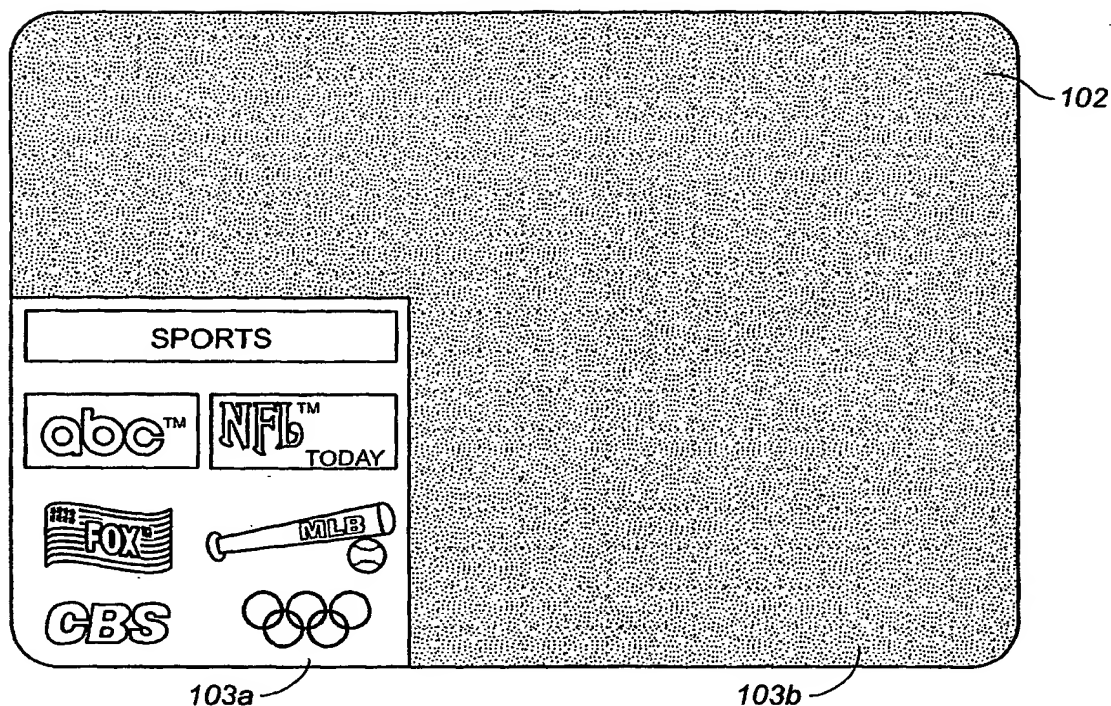


FIG. 2

3 / 7



4 / 7

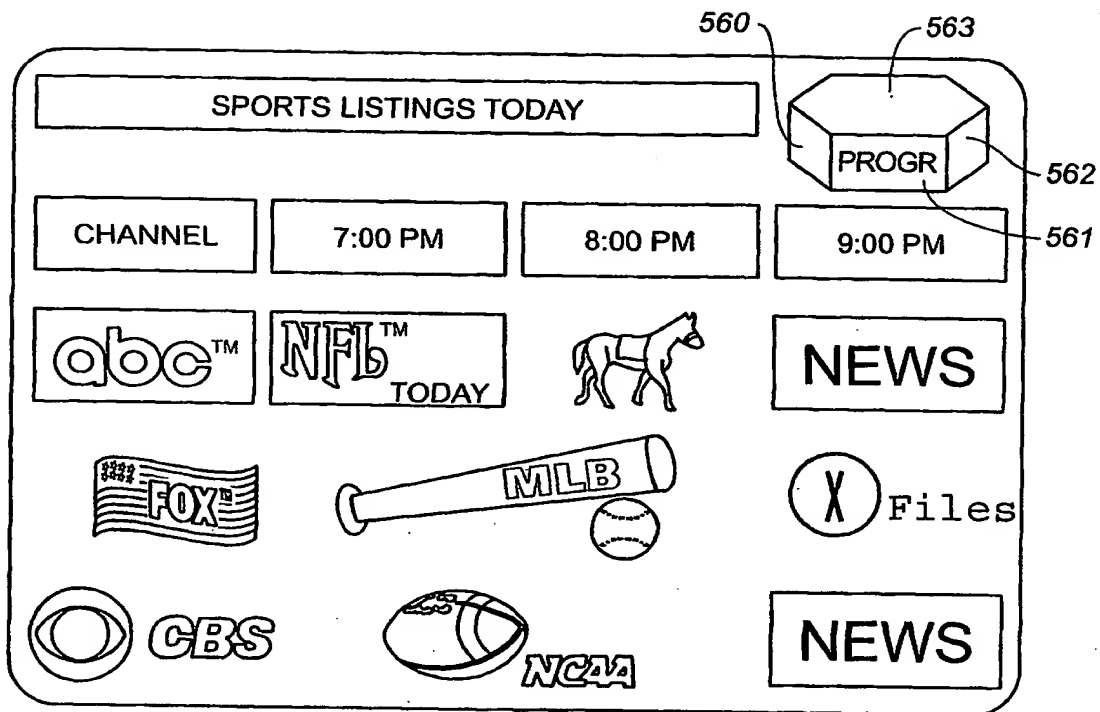


FIG. 2C'

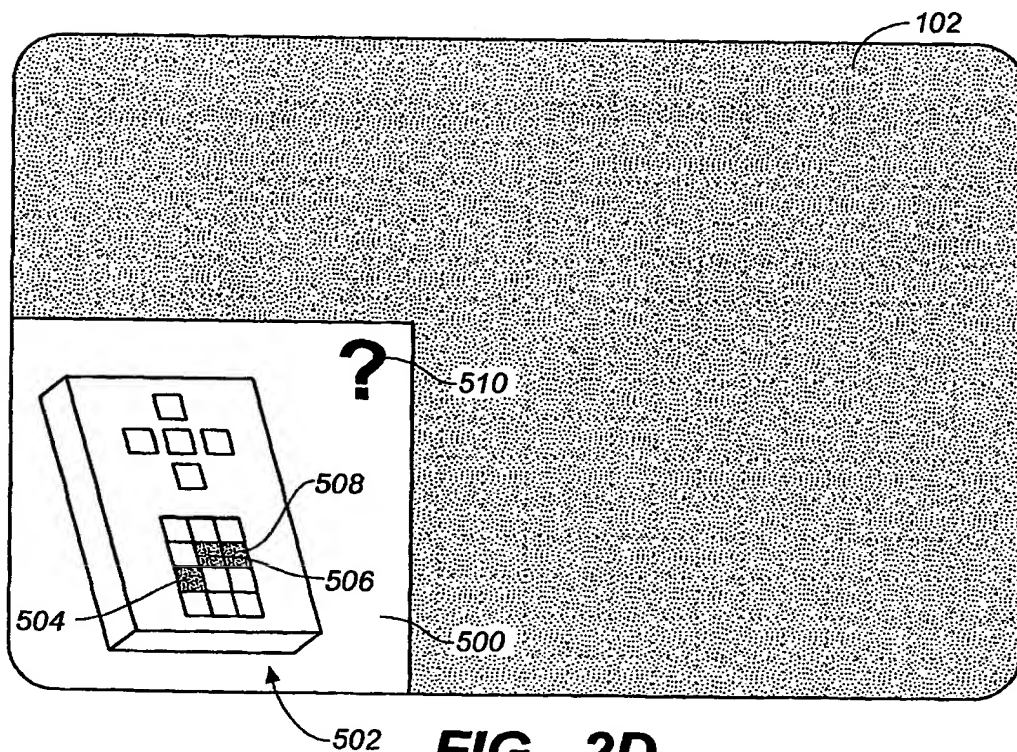
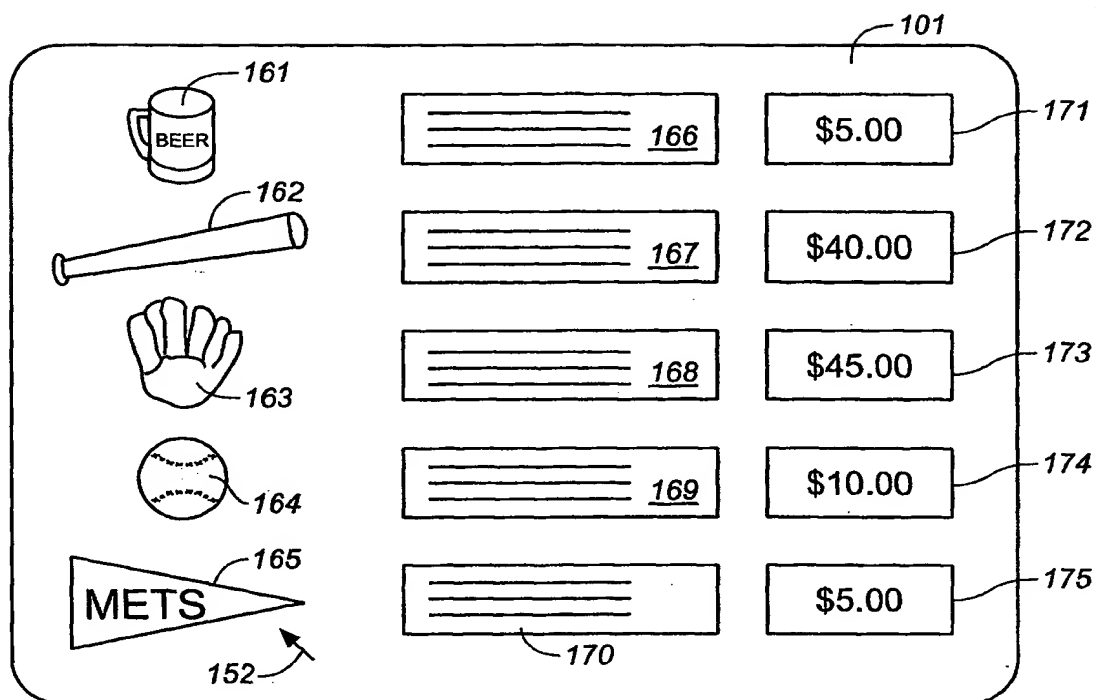
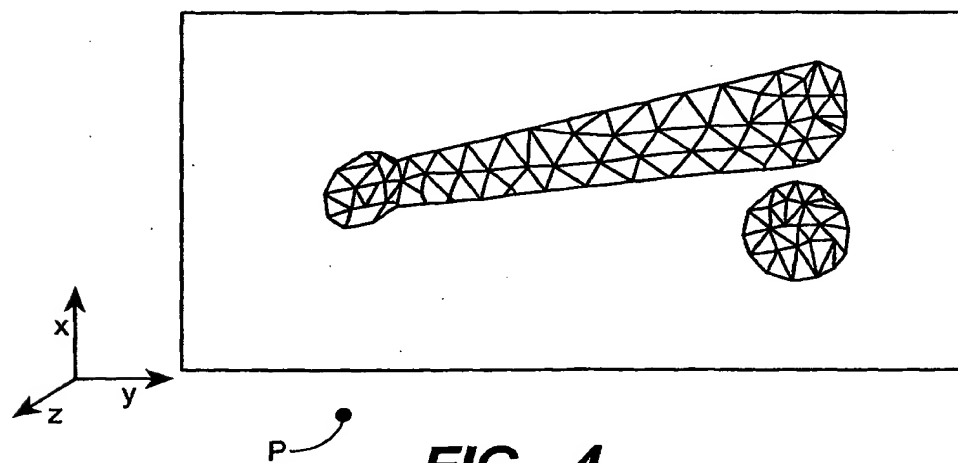


FIG. 2D

5 / 7

**FIG._3****FIG._4**

6 / 7

FIG. 5

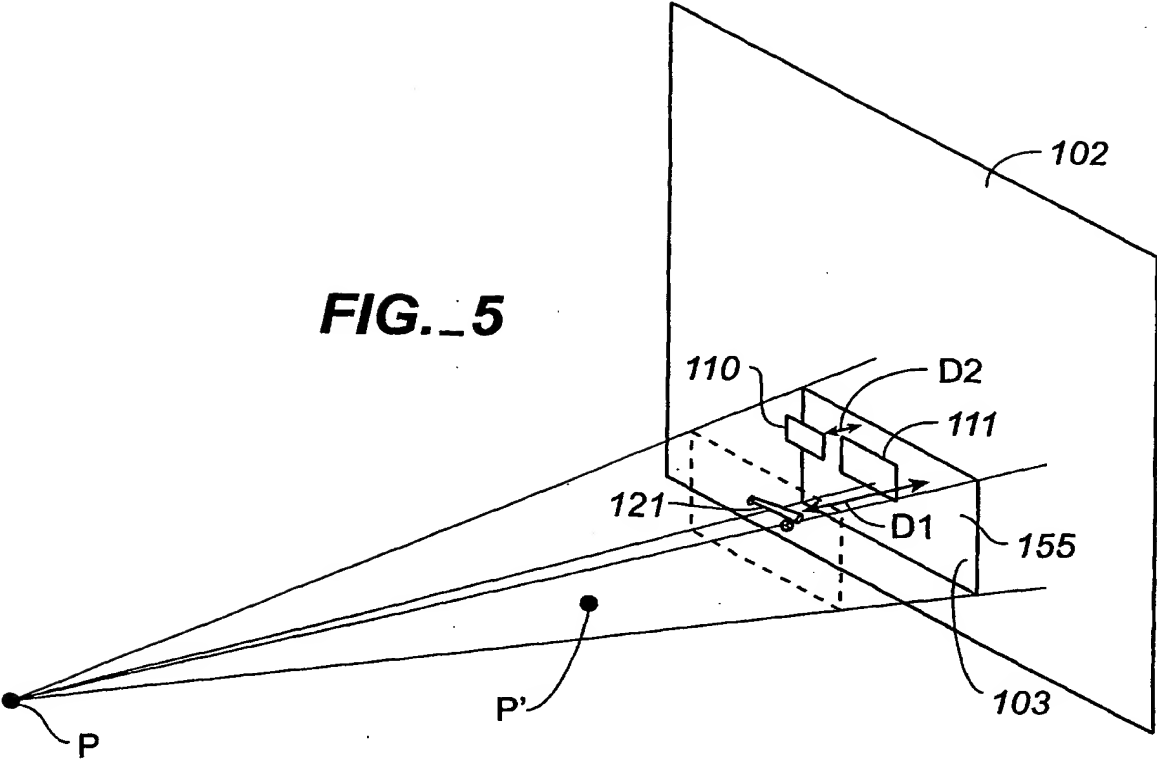
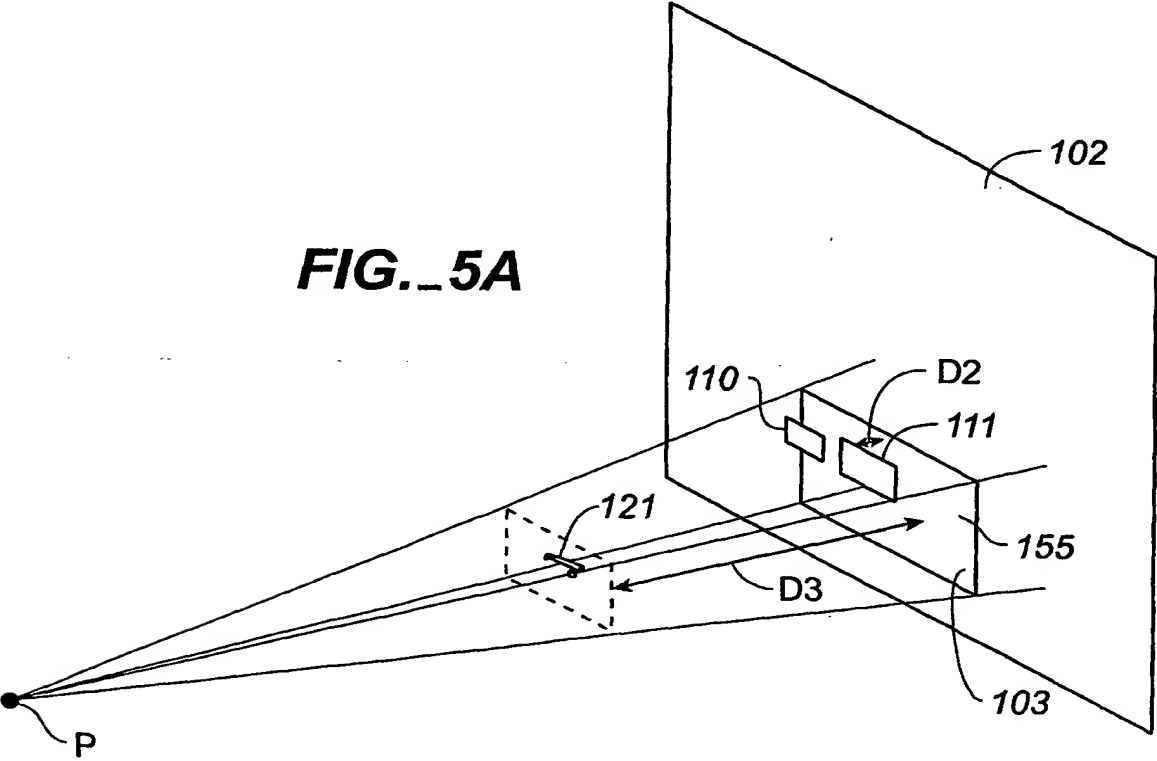
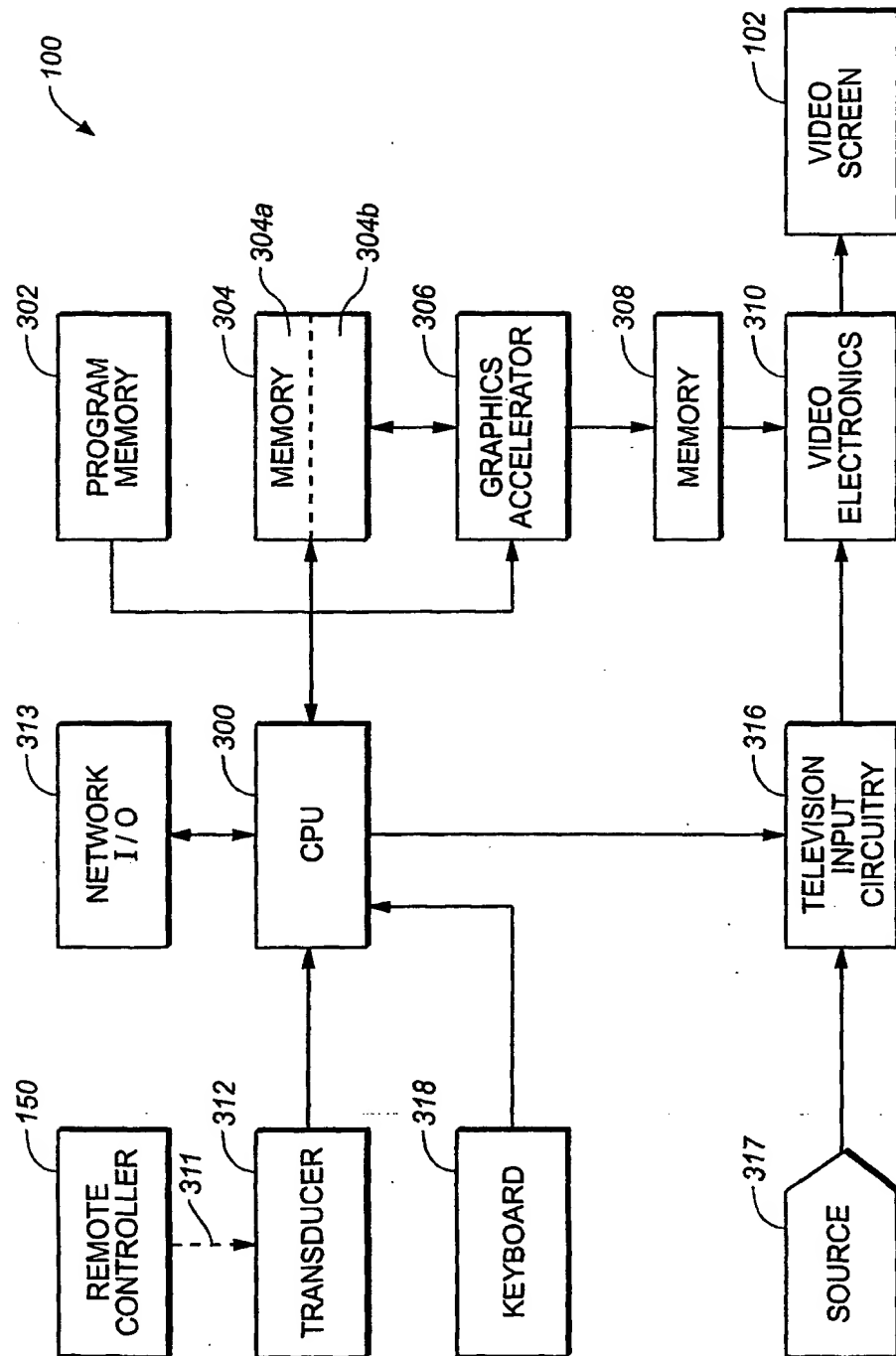


FIG. 5A



7/7

**FIG. 6**

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CORRECTED VERSION

(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
19 July 2001 (19.07.2001)

PCT

(10) International Publication Number
WO 01/52050 A1

(51) International Patent Classification⁷: G06F 3/14,
H04N 5/445, 7/14

(21) International Application Number: PCT/US01/01054

(22) International Filing Date: 12 January 2001 (12.01.2001)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
09/488,361 16 January 2000 (16.01.2000) US

(63) Related by continuation (CON) or continuation-in-part
(CIP) to earlier application:
US 09/488,361 (CON)
Filed on 16 January 2000 (16.01.2000)

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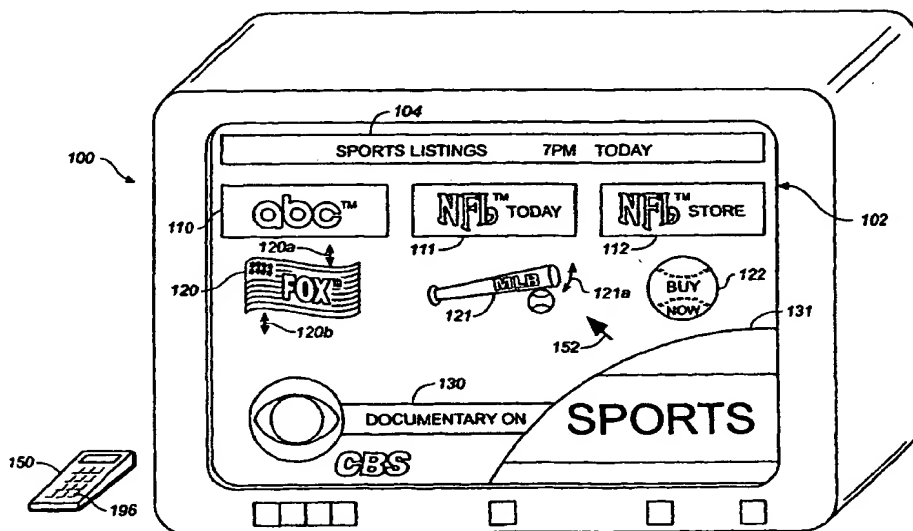
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(81) Designated States (national): AE, AG, AL, AM, AT, AU,
AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CR, CU, CZ,
DE, DK, DM, DZ, EE, ES, FI, GB, GD, GE, GH, GM, HR,
HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR,
LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ,
NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM,
TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW.

(84) Designated States (regional): ARIPO patent (GH, GM,
KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW), Eurasian
patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European
patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE,

[Continued on next page]

(54) Title: ELECTRONIC PROGRAMMING GUIDE



(57) Abstract: An electronic programming guide ("EPG") provides pictograms (120, 121, 122) and logos (110, 111, 112) to indicate what television programs are showing. The EPG information can be displayed in a window within a television screen (102) while a program is shown on the remainder of the screen (102). Thus, the viewer can know what is playing on the various channels while watching one of the channels. The EPG comprises surfaces located in virtual 3D space and a 3D graphics pipeline applies the pictograms, logos, alphanumeric text and/or video clips to the geometric surfaces. The pictograms, logos, alphanumeric data and/or video clip appearance can be modified using a remote controller (150), e.g. by changing the geometric surface position or lighting. Optionally, internet HTML pages are parsed and applied to geometric surfaces in 3D virtual space.

WO 01/52050 A1



IT, LU, MC, NL, PT, SE, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).

Published:

— *with international search report*

(48) Date of publication of this corrected version:

18 October 2001

(15) Information about Correction:

see PCT Gazette No. 42/2001 of 18 October 2001, Section II

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

CORRECTED VERSION

(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
19 July 2001 (19.07.2001)

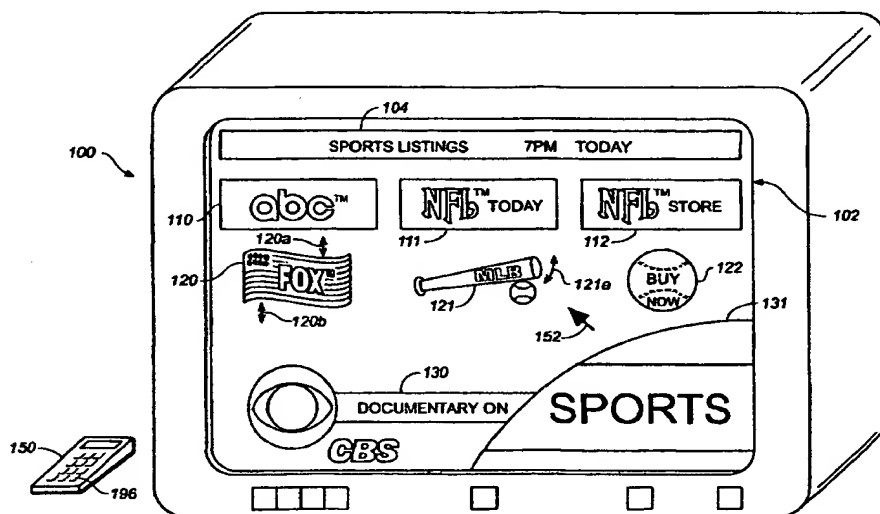
PCT

(10) International Publication Number
WO 01/52050 A1

- (51) International Patent Classification⁷: G06F 3/14, H04N 5/445, 7/14
- (21) International Application Number: PCT/US01/01054
- (22) International Filing Date: 12 January 2001 (12.01.2001)
- (25) Filing Language: English
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- (30) Priority Data:
09/488,361 16 January 2000 (16.01.2000) US
- (63) Related by continuation (CON) or continuation-in-part (CIP) to earlier application:
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- (81) Designated States (national): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CR, CU, CZ, DE, DK, DM, DZ, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW.
- (84) Designated States (regional): ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE,

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WO 01/52050 A1



IT, LU, MC, NL, PT, SE, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).

Previous Correction:

see PCT Gazette No. 42/2001 of 18 October 2001, Section II

Published:

— with international search report

(48) Date of publication of this corrected version:

28 March 2002

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(15) Information about Corrections:

see PCT Gazette No. 13/2002 of 28 March 2002, Section II

ELECTRONIC PROGRAMMING GUIDE

BACKGROUND OF THE INVENTION

The present invention pertains to electronic programming guides ("EPGs").

Presently existing EPGs provide television viewers with on-screen television schedule information, e.g. in a convenient regular or non-regular rectangular grid format. One type of EPG is used in conjunction with an analog television system. In such a system, one of the cable channels is reserved for displaying programming information. The programming information is displayed in a grid, e.g. grid 2 of Fig. 1. Grid 2 comprises four columns 3-6. First column 3 lists the various channels of the cable broadcast system. Columns 4, 5 and 6 indicate what is showing on the channels listed in column 3 in half-hour increments. Thus, if one tunes to the EPG at 10:05 p.m., second column 4 displays what is showing between 10:00 and 10:30 p.m., third column 5 displays what is showing between 10:30 and 11:00 p.m., and fourth column 6 displays what is showing between 11:00 p.m. and 11:30 p.m. A row 7 at mid-screen indicates what time slots columns 4 to 6 correspond to. (A portion 8 of screen 9 above row 7 usually provides continuous advertisements.)

In most cable TV systems, there are more television channels than there is space for rows in grid 2. Accordingly, grid 2 typically scrolls at a pre-selected slow rate, so that a viewer can see what is showing on all of the channels.

The information contained in an analog EPG is typically broadcast by a cable operator on a dedicated one of the channels of the cable TV system.

1 Most digital EPGs operate in a different way. In a digital EPG, program
2 schedule information, and sometimes applications and/or systems software, is
3 transmitted to equipment located on the viewer's premises (usually a "digital set-top
4 box" or STB) by way of broadcast, cable, direct satellite or some other suitable form
5 of transmission. The STB contains memory (and is in essence a dedicated computing
6 device) so that the program schedule information can be stored for later viewing. The
7 program schedule information stored in the STB is periodically updated (e.g., on a
8 continuous, daily, weekly, or biweekly basis). A microprocessor within the STB
9 cooperates with the viewer's television set to display the stored program schedule
10 information and to implement other functions of the EPG in response to user-
11 generated signals. The functions available depend on the sophistication of the
12 particular EPG.

13 Digital EPGs are often used in an interactive television system. In an
14 interactive television system EPG, a user may browse schedule information in any
15 order, select programs from on-screen menus for current or future viewing and order
16 pay-per-view programming on demand. Some EPGs permit other functions, e.g. an e-
17 mail function, or a function that permits a user to block certain kinds of programs
18 such as adult or violent programs.

19 Collectively, prior EPGs fail to provide viewing capabilities that realistically
20 address the viewing habits of the users of these systems. As mentioned above, an
21 analog TV EPG is viewed on a TV screen as a permanently scrolling rectangular
22 table. This solution does not require from users any additional interaction and is
23 suitable for a completely passive television viewer (the so-called "couch potato").
24 Unfortunately, this is a poor solution for interactive TV, because:

1. The scrolling speed is constant and cannot be adjusted.

2. In an analog EPG system, the user cannot switch to the channel of choice immediately from the EPG (e.g. by clicking on a display of a channel number on the EPG). Instead, the user must input the channel number with a remote controller.

3. The analog EPG scrolling table is completely sequential (providing information in an order depending upon channel number) and the user cannot pre-sort schedule data or otherwise personalize the EPG.

A two-way interactive EPG is more sophisticated. Unfortunately this solution also has many problems. Interactive EPG systems provide drop-down menus that require multiple steps in order to interact with the EPG, which is very frustrating when a search for a desired program is unsuccessful. The EPG is inflexible in terms of menu design, because the menu itself is a set of regular two-dimensional grids.

Some of the other problems with prior art EPGs are as follows.

1. Program Description Truncation. When displaying schedule information in grid format, i.e., columns representing time slots and rows representing channels, program titles are generally truncated to fit into the cells of the grid. The width of a grid cell varies with the program duration. Since a 30 minute program is allotted only a small space for the program title and description, titles and/or descriptions for half and even full hour programs often must be truncated to fit in the allotted space. Some systems simply cut off the description of a program without abbreviating it in any way, such that the user cannot determine the subject matter of the program. Although some systems

1 partially alleviate this problem by providing two lines of text in each grid cell,
2 this solution is not ideal because program descriptions may still be truncated.

- 3 2. Inability to Simultaneously Channel Surf and View EPG. Prior EPGs lack a
4 method for creating a viewing itinerary electronically while a user
5 concurrently views a program on the television screen. In other words, when a
6 user views a program on a particular channel, he or she cannot electronically
7 set up a sequence of other channels to surf. Moreover, these prior EPGs leave
8 much guess work for the user as he or she navigates through a sequence of
9 channels. When skimming through channels and trying to determine what
10 program is being displayed on a channel, commonly known as "channel
11 surfing," the user must guess which program is currently being aired from the
12 video segment encountered during channel surfing. Since much--in some
13 cases, up to 30%--of the programming appearing on a channel at any given
14 time is advertising, the user is not provided with any clues as to what program
15 is appearing on a selected channel at a given time. Therefore, the user must
16 wait until the advertisement or commercial ends before learning which
17 program is appearing on the selected channel. Thus, a need exists for an EPG
18 that displays current program schedule information for each channel at the
19 same time that the user surfs through the channels.

- 20 3. Text Size. Unfortunately, current EPGs allow for only one font size.
21 However, human beings do not all have the same acuity of vision. Therefore,
22 some viewers may be unable to read the information in the EPG.

- 23 4. Specular Highlighting. Existing EPGs provide only a very rudimentary
24 lighting capability. In other words, existing EPGs do not have a very

sophisticated ability to adjust the brightness of the EPG. This detracts from the utility of the EPG.

Summary

An EPG in accordance with one embodiment of the invention comprises a set of pictograms containing information identifying programs being shown on a set of video channels. The pictograms comprise non-alphanumeric symbols to assist a viewer in determining what is being shown, even if the various options displayed in the EPG are too small for normal alphanumeric characters to be used. In one embodiment, the pictograms contain one or more colors that assist the viewer in recognizing the pictogram and thereby determining what programs are being shown. In one embodiment, the EPG includes both pictograms and text (alphanumeric symbols) to indicate what programs are being shown.

In one embodiment, the EPG is shown in a window region within a television screen while the other portion of the screen displays a television program. Thus, a viewer can view a program broadcast on a television channel and the EPG simultaneously. The viewer can determine what program is on the channel he is watching, even if the viewer turns to that channel while a commercial is being shown. Further, the viewer can identify other programs and select them by clicking on various icons or pictograms in the EPG. Thus, the viewer can easily select channels showing other desirable programs while the television is tuned to another program.

As mentioned above, the EPG uses pictograms. These pictograms can be distinctive in shape and color. Thus, even if the EPG is "shrunk" to fit in a relatively

1 small window within the TV viewing screen, a viewer can still determine from the
2 EPG which programs are of interest, and which programs are not of interest.

3 In one embodiment, the EPG permits a user to "zoom" in on, or otherwise
4 visually expand portions of, the EPG program listing. Thus, the viewer can identify
5 those parts of the EPG showing programs of interest.

6 In one embodiment, the EPG and EPG pictograms are generated using a 3D
7 graphics pipeline. The EPG comprises a set of textured geometric surfaces that form
8 the pictograms as well as alphanumeric text data. (The geometric surfaces textured to
9 form pictograms and alphanumeric data are called "data surfaces".) The EPG also
10 comprises a set of "video surfaces," i.e. geometric surfaces textured with video
11 images from television programs, previews of television programs, or video data
12 stored in a memory such as a hard disk drive. The geometric surfaces, including both
13 data surfaces and video surfaces, can be arbitrarily positioned in virtual 3D space to
14 provide data and video information. For example, the video surfaces can be
15 positioned in one part of a television screen and the data surfaces can be positioned an
16 another part.

17 In one embodiment, display of the EPG surfaces can be modified in response
18 to certain events, e.g. a remote controller button being pushed. For example, when a
19 control button on a remote controller is actuated to select one of the pictograms, the
20 EPG can highlight the selected pictogram, or alter a video surface showing a program
21 preview. This alteration of the video surface can be in the form of zooming in on the
22 video surface by changing its position in virtual 3D space or changing the color of the
23 video surface by changing specular, ambient, and directional lighting. In one
24 embodiment, the EPG can alter a data surface by changing the texture applied to that

1 surface, changing the lighting applied to that surface, or moving the surface in virtual
2 3D space. By altering the various video and data surfaces, the surfaces (including
3 pictograms) can be observed from different perspectives, (i.e. from different "virtual
4 locations"). This facilitates a viewer zooming in on the various pictograms to better
5 identify what kind of program they represent.

6 In one embodiment, the EPG includes icons or pictograms related to other
7 items of interest, e.g. icons or pictograms that can be clicked on for pay-per-view
8 events. Thus, a viewer can click on a pictogram to watch a pay-per-view boxing
9 match, movie, concert, or other event.

10 In another embodiment, icons or pictograms are included in the EPG
11 corresponding to different types of merchandise or services. A user can click on these
12 pictograms to obtain information concerning these goods and services, and order them
13 using the EPG.

14 In one embodiment, the EPG provides user assistance. This user assistance
15 can be in the form of prompts that are displayed if the viewer presses an inappropriate
16 control button. In another embodiment, the EPG indicates to the viewer what controls
17 are appropriate to actuate in a given situation.

18 In one embodiment, the font size (and the pictogram size) of the EPG image
19 can be adjusted by the user, as can the lighting and colors of the EPG display.

20 These and other features of the invention are described in greater detail below.
21

22 **Brief Description of the Drawings**

23 Fig. 1 illustrates an EPG display in accordance with the prior art.

24 Fig. 2 illustrates an EPG display in accordance with the present invention.

1 Fig. 2A illustrates an EPG display including a set of columns indicating what
2 is being shown on television during various time periods.

3 Fig. 2B illustrates an EPG displayed in a window region within a television
4 screen.

5 Fig. 2C illustrates an EPG display comprising a region for showing thumbnail
6 displays of different programs.

7 Fig. 2C' illustrates an EPG using faces of a polyhedron to show thumbnail
8 displays of different programs.

9 Fig. 2D illustrates an EPG displaying a window indicating which remote
10 controller keys can be pushed.

11 Fig. 3 illustrates a television screen displaying information concerning
12 products that can be purchased using the EPG.

13 Fig. 4 illustrates a set of polygons depicting the surface of a pictogram object
14 to be displayed on a television screen as one of the symbols that constitute part of the
15 EPG.

16 Fig. 5 schematically illustrates 3D aspects of the images displayed in the EPG.
17 Fig. 5 also shows the manner in which an EPG in accordance with the present
18 invention can be viewed concurrently with a television program.

19 Fig. 5A illustrates an EPG in which the location of a virtual object within the
20 EPG has moved to a location closer to a virtual viewer.

21 Fig. 6 is a block diagram of a television system in accordance with the present
22 invention.

23
24 **Detailed Description**

1 This invention relates to an EPG system that provides a user with schedule
2 information for broadcast programs (including cablecast, or datacast programs)
3 viewed by the user on a television or a PCTV. (A PCTV is a personal computer
4 having the capability of displaying video programs.) This invention also relates to an
5 improved EPG that uses a 3D graphics pipeline to display images, alphanumeric text
6 and video data and provides the user with a more powerful and convenient television
7 in a desktop environment, while simultaneously increasing the efficiency of
8 navigation by the user through the EPG.

9 Fig. 2 shows a television system 100 comprising a video screen 102 in
10 accordance with the invention. An EPG in accordance with the invention can be put
11 in any of several modes. In one mode, the EPG is programmed to list television
12 programs of a particular type, e.g. sports programs, movies, children's programs,
13 sitcoms, etc. In the example displayed in Fig. 2, the EPG lists sports programs. In
14 another mode (not shown), the EPG lists movies that are currently being shown on
15 television. In another mode, the EPG lists all programs, regardless of the type of
16 program, in the order of the television station number. In another mode, the EPG lists
17 programs alphabetically. A user can select the EPG mode by actuating appropriate
18 control buttons on a remote control device 150. In Fig. 2, a rectangular title bar 104
19 indicates the type of programs listed by the EPG. In particular, title bar 104 indicates
20 that the programs listed by the EPG are sports programs. The selected listings, as an
21 example only, include three columns, the first of which identifies the various
22 television stations (110, 120, etc.), the second column identifies the program (111,
23 121, etc.) and the third column identifies special activities such as merchandising
24 (112, 122, etc.).

1 Rather than displaying a matrix of rectangular boxes containing text as shown
2 in Fig. 2, 3D objects with real shapes can be displayed on screen 102 along with
3 rectangular or bar shaped text blocks. For example, display element 110 shows
4 "ABC™" in a rectangular block, while display element 120 shows Fox™ as a waving
5 flag, symbolically indicated by arrows 120a and 120b. One example of a method for
6 displaying such an image using 3D accelerator technology is discussed below.

7 Display element 121 is a baseball and bat, thereby indicating that the show in
8 question is a baseball game. Again, motion of the bat is symbolically indicated by
9 arrow 121a. Display element 111 is a text block, indicating that a program being
10 shown is a football game. It is thus seen that the EPG can use both pictograms and
11 text blocks to indicate what program is being shown. However, in other
12 embodiments, only pictograms are used. The pictograms and/or text blocks can be
13 displayed using colors that help identify what program is being shown.

14 The EPG is typically used in conjunction with a remote control device, e.g.
15 remote control device 150. Remote control device 150 can communicate with
16 television system 100 in any of a number of ways, e.g. infrared signals, radio signals,
17 or a cable connection. In one embodiment, the remote control device contains a
18 mechanism by which the user can manipulate a cursor, e.g. cursor 152 on screen 102.
19 Remote control device 150 can comprise a joystick, track ball, touch pad, mouse, a set
20 of up/down left/right buttons, lever, or other type of control mechanism. The user can
21 move cursor 152 to image 110 to select and watch the program playing on the channel
22 corresponding to image 110 (in this example, ABC). Alternatively, the user can move

1 cursor 152 to image 120 to watch the program playing on the channel corresponding
2 to image 120. Alternatively, the viewer can click on image 111 to watch the program
3 corresponding to image 111 (in this case, a NFL football game).

4 As mentioned above, remote controller 150 can use any of a number of
5 transmission techniques to communicate with television system 100. In addition,
6 remote controller 150 can be a dedicated for use with television system 100 (e.g.
7 incorporating a single command set for use with system 100), or remote controller
8 150 can be designed for use in conjunction with different types of devices in addition
9 to television system 100. In addition, remote controller 150 can be programmable so
10 that it can implement different types of command sets. (An example of a remote
11 controller having such programmable capabilities is discussed in U.S. Patent
12 4,918,439, issued to Wozniak et al.)

13 As mentioned above, the third column of images on screen 102 depicts icons
14 or pictograms relating to merchandising. Screen 102 depicts logos or pictograms
15 pertaining to merchandise that can be displayed and purchased using television
16 system 100. For example, adjacent to logo 121 indicating that a baseball game is
17 being shown on a particular station, a large baseball logo 122 appears, indicating that
18 baseball-related products can be viewed and ordered by clicking on logo 122. A user
19 can use cursor 152 to click on these logos to obtain information about the items being
20 sold. For example, a user can click on baseball 122 to access information concerning
21 merchandise that can be purchased using his or her interactive television system.
22 When the user does this, information is downloaded from an information source and
23 displayed on screen 102. This information pertains to products that can be purchased
24 from a vendor. In one embodiment, this information is downloaded from a wide area

1 network ("WAN") such as the Internet. Alternatively or concurrently, the information
2 can be provided by the broadcaster that provides the television programs to television
3 system 100. (This information can be provided on a dedicated channel.
4 Alternatively, the information can be embedded in one of the blanking periods of the
5 television signal, or embedded by any other suitable method compatible with the
6 relevant analog and/or digital broadcast and encryption standards.) When the user
7 clicks on baseball 122, information such as a web page is displayed on screen 102,
8 listing various items that can be purchased, e.g. baseballs, bats, gloves, baseball cards,
9 beer mugs, team banners, etc. For example, a page such as that shown in Fig. 3 can
10 be displayed, illustrating the various items 161 to 165 that can be purchased,
11 information in text blocks 166 to 170 concerning those items, and boxes 171 to 175
12 indicating the price of those objects. In one embodiment, the user can move cursor
13 152 to a picture of one of the items and click on that item to purchase it. (There are
14 different control elements known for moving cursors including but not limited to such
15 as mice, trackballs, gloves, keys, touchpads, joysticks etc. One or more of these
16 control elements can be used to move cursor 152. As mentioned above, one or more
17 of these control elements are typically incorporated in remote controller 150 for this
18 purpose.) When a user clicks on one of items 161-165, a signal is communicated to
19 the cable broadcast system, and the purchaser's order is processed. This can be
20 accomplished using hardware similar to that discussed in U.S. Patent Application
21 09/449,016, filed by Kamen et al. on November 24, 1999 or PCT Patent Application
22 No. PCT/US00/31195, filed November 13, 2000 (docket no. isurfTV11), incorporated
23 herein by reference.

1 Television networks or cable or satellite system operators may display logos
2 or alternatively, a combination of indicative icons and corporate logos on EPG screen
3 102. For example, if a baseball game is played in 3Com park in San Francisco, 3Com
4 Corporation, for an additional fee, can have its logo inserted on screen 102 in lieu of
5 or along with baseball and bat pictogram 121. Alternatively, in lieu of or along with
6 baseball and bat pictogram 121, screen 102 may display logos of the teams playing.
7 These logos can appear alone or placed on or adjacent to an image of a baseball to
8 highlight the fact that the program in question is a baseball game. Numerous other
9 combinations can also be displayed on screen 102.

10 Stations can use special logos or pictograms to be displayed by the EPG for
11 their show categories, such as a magnifying glass for mysteries (or, alternatively a
12 handgun), a smiling face for sitcoms, a guitar for music videos, etc. These logos or
13 pictograms facilitate recognizing a show.

14 In some embodiments, the EPG grid can display text blocks and pictograms
15 corresponding to some programs. Accordingly, screen 102 can get crowded.
16 However, it will remain easy to recognize the shows by the shape and/or motion of
17 the displayed pictograms, especially compared with the rectangular text blocks used
18 in current EPGs. Further, if the pictograms on screen 102 use different colors
19 (particularly unique colors), this further enhances readability of an EPG in accordance
20 with the present invention compared with currently existing EPGs.

21 In one embodiment, the text blocks appearing in the EPG, if any, can also
22 have unique colors and or fonts, which make it easier to recognize them as well.

23 In one embodiment, the user can program the EPG to modify the color and
24 brightness of the different pictograms and text blocks, or to assign different color

1 schemes to the pictograms or text blocks. Thus, a user might have all comedy-related
2 pictograms or text blocks color-coded as bright blue, and all dramas are color coded
3 as bright red. This further enhances the ability of the user to use the EPG to select
4 desired programs with great ease. In particular, program types may be recognized,
5 even if the text is too small to read. (The EPG typically receives information from the
6 broadcaster indicating the types of programs being broadcast. The EPG can then
7 display the program information in the appropriate color. This information can be
8 received as part of the cable broadcast signal, or can be received from another source,
9 e.g. a LAN or WAN.) The color of the various pictograms and text blocks can be
10 modified by controlling the color of a "virtual lighting source" (described below) that
11 is used to generate the image. Alternatively, the color of texture pixels used to
12 generate the image can be modified. (As explained below, the various text blocks and
13 pictograms are generated using a 3D graphics pipeline. This pipeline generates
14 images by applying texture maps to one or more geometric surfaces, and applying a
15 virtual light source to the textured surface or surfaces. The process by which this is
16 done is described below.)

17 In one embodiment, the EPG pictograms and text blocks are scaled in the x
18 and y directions to show expected run times. Alternatively, in another embodiment,
19 the EPG pictograms and text blocks are scaled in the x and y directions to show their
20 importance or rating on a scale, to which the viewer can subscribe. For example, in
21 one embodiment, the user can subscribe to a movie rating service that rates the quality
22 of movies. Information from the rating service can either be entered into the EPG
23 system by the user, or by the cable system broadcaster. Exceptionally good films can

1 be highlighted, e.g. by expanding the text block or pictogram associated with those
2 films.

3 Similarly, the EPG can be programmed with information indicative of a user's
4 tastes. Thus, if the system is programmed with information indicating that the user
5 particularly enjoys sports programs, the EPG will highlight or expand those text
6 blocks and pictograms corresponding to sporting events. Similarly, if the system has
7 been programmed to indicate that the user prefers educational television, the EPG will
8 highlight or expand those text blocks and pictograms corresponding to educational
9 programs.

10 Fig. 2 illustrates an EPG display screen with three columns. In other
11 embodiments, the EPG comprises more than three columns. For example, as shown
12 in Fig. 2A, a first column 190 lists program channels, a second column 191 depicts
13 programs currently playing, a column 192 depicts programs playing in the next half-
14 hour, and a fourth column 193 depicts programs playing in the half hour after that. In
15 Fig. 2A, baseball bat 121 spans columns 191 and 192, thereby indicating that the
16 baseball game is expected to continue into the time slot corresponding to column 192.
17 However, text block 111 does not extend through into column 192. This indicates
18 that the football game is not expected to extend into the time slot corresponding to
19 column 192. As can be seen, a pictogram 194 indicates that after the football game,
20 ABC will be showing a horse race.

21 EPG Window Region

22 As mentioned above, frequently a viewer will want to channel surf while
23 being able to determine what program he or she has just turned to. If a commercial is
24

1 playing, the viewer has no way of knowing what program is on. In one embodiment,
2 the viewer can press a control button on remote controller 150 that causes a window
3 103a to open on screen 102 Fig. 2B). The EPG is displayed within window 103a.
4 Thus, a user can channel surf and watch programs on portion 103b of screen 102,
5 while simultaneously seeing an identification of the program that he or she is
6 currently watching. This is particularly useful if a commercial is playing. In addition,
7 the user can see what is playing on other channels, and he or she can click on
8 pictograms or text blocks corresponding to those other channels (or pictograms or text
9 blocks corresponding to the programs being shown on those other channels) to change
10 the channel of the television system. This represents a major improvement over prior
11 art EPGs, which typically take up an entire television screen. Thus, these prior art
12 EPGs do not permit a user to simultaneously watch one channel while investigating
13 what is on other channels.

14 15 EPG Embodiment Displaying Magnified Segments

16 In one embodiment, it may be desirable to permit a user to magnify portions of
17 the EPG so that the user can get a better view of what is being displayed.
18 Accordingly, remote controller 150 contains a button 196 that permits the user to
19 expand a selected portion of the EPG display. This is schematically shown by a bar
20 130 that extends into a region 131 of screen 102. As can be seen, the portion of bar
21 130 extending into region 131 is magnified, so the viewer can more easily see what
22 bar 130 represents. A user can control which portions of the EPG display are
23 magnified by pressing button 196 and moving cursor 152 to a portion of the display
24 that the viewer wants magnified.

EPG Embodiment Displaying 3D Images

In one embodiment, the graphics circuitry that provides the information displayed on screen 102 stores the image elements in a 3D model and generates the image using a 3D accelerator. This is done in a manner similar to that described in our PCT patent application WO 00/46754 (corresponding to U.S. Patent Application 09/344,442, docket No. isurfTV1) and WO 00/46753 (corresponding to U.S. Patent Application 09/361,470, docket No. isurfTV2). (These PCT Applications describe 3D accelerator technology and are incorporated herein by reference.) Briefly, this is accomplished by a) storing a computer model of a geometric surface of one or more pictograms in a first set of memory locations within the television STB; b) storing within a second set of memory locations a two dimensional image to be mapped onto that surface (e.g. a pixel array); and c) constructing a pixel array comprising image 121. For example, image 121 is typically generated in the following manner.

1. A computer model describing the object depicted by image 120 is received from a source such as the broadcaster or some other source and stored in one or more memory devices within the STB. The computer model is typically in terms of a) a set of geometric surfaces; and b) pixel data that is to be applied, or "bound" to those surfaces. The geometric surfaces can be defined in terms of a set of polygons, e.g. triangles. Each polygon is defined in terms of the x, y, z coordinates of its vertices. Alternatively, these surfaces can be defined in terms of a mathematical formula (i.e. "implicitly defined"). Fig. 4 schematically illustrates the polygons used to model the shape of the object depicted by image 121. Fig. 4 has the appearance of a wire frame model of

1 polygons that show the shape of the surface and three-dimensional features (if
2 any) of the object depicted by image 121. This wire frame model is not shown
3 on screen 102, per se. Rather, Fig. 4 is merely provided to schematically
4 indicate what kind of information is contained in the memory file that
5 describes the geometric surfaces. Further information concerning the process
6 of constructing a mesh of polygons is described in standard graphics libraries,
7 such as Real 3D, published by Real 3D, a Lockheed Martin Corporation in
8 1996, and Direct 3D, published by New Riders Publishing in 1997, each of
9 which is incorporated herein by reference. The pixel data (contained in
10 another memory file) includes information corresponding to colors and
11 patterns to be applied to the polygons of Fig. 4. In the case of image 121, this
12 would include a pixel array illustrating the appearance of wood, i.e. the wood
13 finish of a baseball bat, the appearance of the baseball, and the letters "MLB".

14 2. The pixel array data is then "bound" to the to mesh of polygons. This is
15 accomplished by mapping polygon vertices to a location in the pixel array.
16 This portion of the process is roughly analogous to an upholsterer choosing a
17 piece of fabric, and binding it with a few nails to the corner of a couch being
18 upholstered. The upholsterer subsequently asks his apprentice to finishing
19 attaching the fabric to the couch. In this case, the 3D graphics accelerator
20 finishes the task instead of an apprentice.

21 3. Thereafter, information is communicated to the 3D graphics accelerator within
22 the STB identifying the location of a "virtual viewer." In other words,
23 information is communicated to a 3D graphics accelerator identifying a point
24 of reference P (Fig. 4) from which the object of image 121 is to be observed.

1 Usually, point of reference P is a "default" position, and is simply some
2 distance in front of the baseball bat. However, as explained below, a user can
3 change the position P of this virtual viewer, e.g. with remote control device
4 150.

5 4. Information concerning a virtual lighting source is also communicated to the
6 3D graphics accelerator. This information can include a) the color of the light
7 being provided by the lighting source; b) the brightness of this virtual lighting
8 source; and c) whether the lighting source is diffuse or specular.

9 5. Thereafter, the 3D graphics accelerator within the STB generates image 121
10 (typically in the form of a pixel array) of the baseball bat as that baseball bat
11 would be perceived by a virtual viewer if the virtual viewer were located at
12 point P and the baseball bat were illuminated with the selected lighting source.
13 The other pictograms, text blocks and images shown in Fig. 2 can be similarly
14 generated. (As explained below, video programs and video clips can be bound
15 to geometric surfaces for display on screen 102 as part of the EPG in a similar
16 manner.)

17 As mentioned above, more details concerning the basic process of generating 3D
18 images are discussed in the above-incorporated WO 00/46754 and WO 00/46753
19 applications. Also see Foley et al., "Computer Graphics" published by Addison-
20 Wesley in 1996, incorporated herein by reference.

21 The fact that the various pictograms are generated in the above-described
22 manner has a special significance for an EPG in accordance with the invention. In
23 particular, the EPG maintains the various pictograms and blocks of the display in the
24 form of a 3D object model. Thus, a user can "zoom" toward or away from the various

1 pictograms of the EPG to make it easier to see what programs are being displayed.
2 This is accomplished by pressing appropriate control buttons on remote controller 150
3 and causing the 3D graphics accelerator to regenerate the EPG images from a
4 different reference point, e.g. a reference point closer to the baseball and bat. Thus,
5 image 121 of the baseball and bat will appear larger on screen 102.

6 The 3D aspects of the EPG are schematically shown in Fig. 5. Referring to
7 Fig. 5, screen 102 is displaying a television program, but window 103 within screen
8 102 displays the EPG information. Since the EPG information is confined to window
9 103, it is somewhat shrunk. The image of the various icons and pictograms of the
10 EPG are generated using a 3D graphics accelerator, and are displayed as if a virtual
11 viewer were watching these icons and pictograms from a particular distance. A
12 viewer can "zoom" toward the pictograms to get a closer view of them by adjusting
13 an appropriate control element on remote controller 150 (e.g. a touch pad, mouse,
14 joystick, track ball, etc.). In this way, the user can take a closer look at the
15 pictograms.

16 Also, since the images of the pictogram objects are generated from a computer
17 model such that each object is at different virtual location in space, a viewer may "fly"
18 his virtual camera position close up to an object, and thus be able to see more details.

19 As can be seen in Fig. 5, image 121 is roughly a virtual distance D1 from the
20 planar background portion 155 of the EPG. Text blocks 110 and 111 are a virtual
21 distance D2 from planar background portion 155 of the EPG, whereas baseball 121a
22 and bat 121 are a virtual distance D2 from planar background portion 155. By
23 manipulating the position of the virtual viewer, located at point P, the virtual viewer
24 can "fly" or "zoom in" on the various portions of the EPG, e.g. by moving the

1 location of the virtual viewer to a point P'. (Of course, the actual viewer doesn't need
2 to move. Rather, the graphics accelerator within television system 100 reconstructs
3 the EPG image on screen 102 as that image would be seen by a virtual observer
4 moving from point P to P'.)

5 In one embodiment, in lieu of, or in addition to moving the position of virtual
6 viewer P, one can also move the location of the objects displayed in the EPG. For
7 example, in one embodiment, a user can click on object 121 (the baseball bat). The
8 EPG can respond by reconstructing the image of the baseball bat on a geometric
9 surface located a distance D3 from plane 155 (Fig. 5A). This creates the visual
10 impression of having the baseball bat 121 move closer to the television viewer so he
11 has a better view of what he has just clicked on and selected. The viewer can then
12 confirm his selection by clicking, once again, on baseball bat 121.

13 Just as the location of pictograms can be changed by clicking on them, the
14 location in virtual 3D space of text blocks can also be changed in the same manner.
15 (As mentioned above, the text blocks are can be mapped onto geometric surfaces in
16 the same manner as the various pictograms.)

17 Referring back to Fig. 4, in one embodiment, the polygon mesh in the shape of
18 the baseball and bat can be a two-dimensional polygon mesh. In other words, all of
19 the polygon vertices are coplanar (i.e. the polygon mesh is flat) and all of the vertices
20 have the same z dimension. The mesh has the outline of a baseball and bat when
21 viewed from a direction perpendicular to the plane of the mesh. (When the vertices
22 have the same z dimension, all of the vertices are the same distance from a virtual
23 plane 155. Virtual plane 155 is the plane of the EPG background.) Arranging the
24 polygon vertices so that they are all coplanar has the advantage that any text mapped

1 onto the polygons using the 3D accelerator (e.g. the letters "MLB" in Fig. 2) is easily
2 read. However, in another embodiment, the polygons are not all coplanar, and in fact,
3 can actually be a 3 dimensional model of a baseball and bat. On other words, the
4 polygons are not flat in this other embodiment. The polygons collectively form the
5 shape of a baseball and bat in three dimensions. (The ball is spherical and the bat is
6 roughly cylindrical.) In this embodiment, the polygon vertices have different z
7 values.

8 9 Help Mode

10 An EPG in accordance with one embodiment of the invention can include
11 several features that enhance user friendliness. For example, in one embodiment, the
12 EPG provides an indication of which buttons on the remote controller can be actuated
13 in a given situation. In another embodiment, the remote controller contains a light
14 emitting diode (LED) or other indicator, and if a user presses an inappropriate button
15 on the remote controller, the LED illuminates, thereby informing the user that he or
16 she is doing something improper. (In this embodiment, the CPU within video system
17 100 typically sends a signal to remote controller 150. Alternatively, in this
18 embodiment, a microprocessor within the controller itself determines when an
19 inappropriate button is being pressed.)

20 In yet another embodiment, the various control buttons of the remote
21 controller contain or are associated with LEDs or other indicators (e.g. liquid crystal
22 displays (LCDs) in conjunction with a touch screen etc.). The LEDs corresponding to
23 those buttons that can be pressed in a given situation illuminate, thereby informing the
24 viewer which buttons he or she can press in a given situation.

1 In yet another embodiment, the EPG may include a window on screen 102
2 (not shown) that indicates to the user which buttons would be appropriate to actuate in
3 a certain situation.

4 In yet another embodiment, the EPG displays user assistance information on
5 screen 102 if the user tries to actuate an inappropriate button on remote controller
6 150.

7 In yet another embodiment, the remote controller contains a "help" key. If the
8 user presses the help key, screen 102 provides a window 500 showing an image 502
9 of remote controller 150, and indicating which keys can be pressed in a given
10 situation (Fig. 2D). (The keys that can be pushed, e.g. keys 504, 506 and 508) are
11 highlighted.

12 By indicating to the user which keys can be pressed in a given situation, user
13 friendliness of an EPG in accordance with the invention is enhanced.

14 In one embodiment, the EPG provides automated assistance to a user. This
15 can be provided in several ways. For example, as mentioned above, the EPG can
16 indicate to the user which remote control keys can be used in a situation. Additional
17 information on their respective functions may also be provided. In another
18 embodiment, the EPG includes a question mark icon 510 (Fig. 2A and 2D). The user
19 can click on this icon, to obtain help information. Alternatively, the user can click on
20 question mark icon 510 and drag it to a pictogram on screen 102 to obtain information
21 about what that pictogram does.

22 In one embodiment, one of the buttons on remote controller 150 is a "help"
23 button that causes the EPG to depict on screen 102 a help menu. The EPG may

1 suggest various "help" options by highlighting appropriate options to better guide the
2 user.

3
4 Description of the Hardware Within the STB

5 Referring to Fig. 6, the hardware used by the receiver to practice the invention
6 typically comprises a) a CPU 300 (e.g. a Celeron or Pentium, manufactured by Intel
7 Corporation, or any other equivalent CPU) coupled to a) a program memory 302
8 (typically a ROM, EPROM, EEPROM, EAROM, hard disk, CD ROM, or other
9 memory device); b) a second memory device 304 (e.g. a RAM or magnetic disk); and
10 c) a graphics accelerator circuit 306. Program memory 302 contains the program
11 instructions executed by CPU 300. Memory 304 can comprise one or more memory
12 devices. In one embodiment, memory 304 contains a) a portion 304a containing
13 information concerning the polygons used to construct images of objects; and b) a
14 portion 304b containing pixel information to be applied, or bound, to the polygons.
15 Graphics accelerator 306 accesses the information contained in memory 304 and
16 constructs an image in a pixel array memory 308. Information from pixel array
17 memory 308 is provided to video electronics circuit 310 for display on video display
18 screen 102.

19 Also shown in Fig. 6 is remote control device 150, which is manipulated by a
20 user as described above. Remote control device 150 provides signals (typically
21 communicated via infra red communication (or any other method as previously
22 described) shown as dotted line arrow 311) to a transducer 312 that is coupled to CPU
23 300. CPU 300 reads the signals provided by remote control device 150, and controls
24 the images displayed on video screen 102 in response thereto. Also, many small

1 differences can be made in the "architecture" of connecting the remote control base
2 unit (e.g. the transceiver that receives signals from remote controller 150). In some
3 cases this architecture may mimic a parallel or serial port, and in other cases it may
4 mimic a mouse and or a keyboard. This is advantageous, since it allows remote
5 controller 150 to send commands directly to system 100, without requiring special
6 driver software.

7 Also shown in Fig. 6 is a network I/O circuit 313. Network I/O circuit 313
8 can be any of numerous different types of circuits, e.g. a modem for communicating
9 with the internet, or an interface circuit for communicating with other LAN or WAN
10 networks. As mentioned above, by clicking on icon or pictogram 122, a user can
11 obtain data concerning items that can be purchased from different vendors. In one
12 embodiment, when a user clicks on one of these icons, a signal is communicated to a
13 server coupled to the LAN or WAN network, and that server communicates via
14 network circuit 313 back to CPU 300 information to be displayed on screen 102
15 concerning merchandise that can be ordered from that vendor. This information can
16 be in the form of a web page, for example. Network circuit 313 can also be used to
17 order pay-per-view items via a LAN or WAN.

18 Also shown in Fig. 6 is a television input circuit 316. Circuit 316 receives a
19 video signal from a source 317, e.g. a television antenna, an electrical or optical cable
20 system, a satellite system, or any other appropriate video signal source. This signal is
21 communicated to video electronics 310 for display on screen 102.

22 In one embodiment, the EPG can receive information and commands by a
23 keyboard 318 that is electrically coupled to CPU 300. Keyboard 318 can be an
24 alphanumeric keyboard, e.g. a qwerty keyboard. However, other types of keyboards

1 can be used in conjunction with the EPG. Keyboard 318 provides additional
2 flexibility for a user controlling the EPG.

3
4 Other Programmable Options

5 In one embodiment, the EPG can be programmed to provide to the user a
6 reminder when certain programs of interest are going to be on. This can be
7 accomplished using remote controller 150, clicking on a selected program pictogram,
8 and pressing a control button on the remote controller that instructs CPU 300 to
9 display a prompt on screen 102 shortly before that program is to be broadcast.
10 Alternatively, remote controller 150 can have a numeric keyboard or a more
11 complicated input control console for purposes of entering such information into the
12 EPG. Alternatively, keyboard 318 can be used to enter this information.

13 In one embodiment, a user can modify the format in which the EPG
14 information is to be displayed. For example, the user can adjust the size of the text
15 (e.g. the font size) of the information displayed by the EPG. Thus, viewers with poor
16 vision will be better able to read the information displayed by the EPG. Viewers with
17 good vision can shrink the text size so that more information can be displayed on the
18 screen by the EPG. This can be accomplished by using remote controller 150 to cause
19 CPU 300 to display an appropriate menu of control options on screen 102. The user
20 can then click on the displayed options to enter a text font size into the EPG. (The
21 text font size is typically stored within a memory in the EPG, e.g. within memory
22 304.) Rather than clicking on text font size options, text font size information can be
23 entered into the EPG using keyboard 318.

1 There is a number of ways one can enter mode information into the EPG. For
2 example, remote controller 150 can have a mode button. When the mode button is
3 pressed, a list of programmable menu options appears on screen 102, and the user can
4 click on a desired option. Alternatively, the EPG can have a menu icon, and the user
5 can click on the menu icon. Alternatively, there can be a menu button on video
6 system 100 itself that a user can push. Other techniques can be used to communicate
7 programmable option choices to the EPG.

8 9 EPG With Reduced Size Program Displays

10 In another embodiment, portions of the EPG can be used to display reduced
11 size (for example, thumbnail) versions of programs appearing on various channels,
12 thereby permitting a viewer to preview programs. For example, optionally, a portion
13 320 of screen 102 (Fig. 2C) can depict a thumbnail display of what is playing on one
14 of the channels. In another embodiment, portion 320 of screen 102 can depict a set of
15 reduced size displays (e.g. in portions 320a, 320b, and 320c of portion 320 of screen
16 102) so that a viewer can see what is showing on different channels. In an alternative
17 embodiment, the reduced size displays can be mapped into geometric surfaces, e.g. of
18 a polyhedron (e.g. a cube) as described in PCT Patent Application WO 00/46680,
19 corresponding to U.S. Patent Application Serial No. 09/378,184, filed 8/20/99 by
20 Kamen et al. (attorney docket no. isurfTV4), and U.S. Patent Application 09/378,220,
21 filed 8/20/99 by Kamen et al. (attorney docket no. isurfTV4A). The WO 00/46680,
22 '184 and '220 Applications are incorporated herein by reference.

23 The WO 00/46680, '184 and '220 Applications teach mapping (or binding)
24 video images onto geometric surfaces using 3D accelerator technology. A 3D

1 graphics accelerator generates a pixel array corresponding to these images as bound
2 onto the geometric surfaces. By altering the position of a "virtual viewer", or by
3 altering the shape or angle of the geometric surface, one can create an appearance
4 similar to projecting a movie onto a surface having a particular shape, or held at a
5 particular angle. The WO 00/46680, '184 and '220 applications teach, among other
6 things, that one can display a polyhedron (e.g. a cube), with different video images
7 appearing on the various faces of the cube. One can alter the orientation of the
8 polyhedron using the remote controller so that different polyhedron faces are exposed.
9 In one embodiment of the invention, programs from different channels are mapped
10 onto different faces of a polyhedron (e.g. faces 560, 561 and 562 of an octahedron 563
11 in Fig. 2C'). A viewer can rotate octahedron 563 to obtain a thumbnail display of
12 what is playing on the various channels. (For such an embodiment, it is typically
13 desirable to include a video capture card within system 100 for downloading the video
14 signals into a pixel memory so that graphics accelerator 306 can map these pixels onto
15 the various geometric surfaces of polyhedron 563.)

16 The location and angle of the geometric surface upon which video clips are
17 mapped can be modified by the EPG. For example, by clicking on a reduced size
18 video image, the user can cause the EPG to move the image closer to the virtual
19 viewer (i.e. enlarge the portion of the screen showing the video image.)
20

21 EPG Operating as Shell or Window For Other Applications

22 In one embodiment, the EPG system provides a reliable and efficient method
23 of updating or replacing the application software that implements the electronic guide
24 at the user sites. This can be accomplished by downloading such software either from

1 the cable broadcaster (e.g. from source 317 using input circuitry 316), or via a WAN
2 or LAN, e.g. using network I/O circuit 313 (Fig. 6). The EPG software can be
3 designed in modules. For example, one module is optionally a graphics user interface
4 (GUT) module, whereas another module can handle the different display icons.
5 Another module can handle 3D graphics generation, and another module can be a
6 master program module. These modules can be downloaded into program memory
7 302. EPG updates can be provided either automatically or in response to a prompt
8 from the user using remote controller 150.

9 In an embodiment which permits the automated updating of software, the
10 program memory 302 should contain a programmable segment (e.g. a RAM,
11 EEPROM, EAROM, magnetic memory or magneto-optic memory) to accommodate
12 the loading of data.

13 In one embodiment, the EPG operates as a shell or window to enable a user to
14 access other applications or information systems that are not part of the EPG
15 application or data. For example, in one embodiment, when using the EPG, one can
16 press a button on the remote controller, or click on an icon within the EPG to active
17 Internet server software (e.g. Netscape software Internet Explorer software, or other
18 web surfing software package). (Such software can be stored within program
19 memory 302.) In this embodiment, the information provided by the web and the web
20 surfing software package is bound to a flat geometric surface and displayed on screen
21 102. The viewer can then use the screen to browse the Internet as if he or she were
22 logged onto a PC. (In such an embodiment, it is typically desirable to couple
23 alphanumeric keyboard 318 or other alphanumeric input device to video system 100
24 so that the user can enter key words for searching or type URLs into system 100. In

1 this embodiment, system 100 communicates with a proxy server or other ISP via
2 network I/O circuit 313 (Fig. 6).

3 The options and features described above can be combined to provide a 3D
4 enhanced EPG that allows user friendliness and interactivity not known in current
5 EPG systems. However, these options and features can be practiced independently.
6 Further, different combinations of these options and features can be practiced in an
7 EPG.

8 While the invention has been described with respect to specific embodiments,
9 those skilled in the art will appreciate that changes can be made in form and detail
10 without departing from the spirit and scope of the invention. For example, an EPG in
11 accordance with the present invention can be displayed on CRT, LCD, projection, or
12 other types of display systems. The EPG can be displayed on a television, personal
13 computer, or a device that is a combination television/personal computer. The EPG
14 can be used in conjunction with video signals that are provided by electrical or optical
15 cable, radio wave broadcast, satellite broadcast, or other types of video signal
16 transmission. The information displayed in the EPG can originate from any of
17 numerous sources, e.g. provided via electrical or optical cable, radio waves, satellite
18 broadcast, or a wide area network (for example, the Internet).

19 When displaying video information, the video information can be applied to a
20 geometric surface using a 3D graphics pipeline. Thus, as shown in Fig. 2B, both the
21 EPG in portion 103a of screen 102 and the television program in portion 103b can be
22 bound to geometric surfaces and displayed using a 3D graphics pipeline. (In fact, in
23 one embodiment, when watching the television program without the EPG, the

1 television program can be bound to a geometric surface and displayed as described
2 above.)

3 As explained in the above-incorporated WO 00/46754 and '442 applications,
4 the 3D graphics pipeline can be implemented by a combination of hardware elements,
5 known as accelerators, and software, some of which is referred to as drivers. The
6 partitioning between hardware and software may vary. Accordingly, all of these
7 modifications come within the present invention.

1 We claim:

2 1. A method for displaying programming information comprising:
3 displaying a video program on a first portion of a video display device; and
4 simultaneously displaying on a second portion of said video display device a
5 programming guide indicating what programs are playing on other channels.
6

7 2. Method of claim 1 wherein said second portion of said video display
8 device comprises a window region within said first portion of said video display
9 device.
10

11 3. Method of claim 2 wherein said video display device comprises a
12 video screen.
13

14 4. Method of claim 4 wherein said programming guide comprises
15 information in the form of pictograms, at least some of said pictograms comprising
16 color-coded information.
17

18 5. Method of claim 1 wherein said displaying of said programming guide
19 comprises using a 3D graphics pipeline to generate images of pictograms.
20

21 6. Method of claim 5 further comprising generating said images from the
22 perspective of a virtual viewer, said method further comprising manipulating the
23 position of said virtual viewer with a controller.
24

1 7. Method of claim 6 further comprising selecting another program from
2 said programming guide information and displaying said selected program on said
3 first portion of said video display device.

4
5 8. Method comprising:
6 displaying an electronic programming guide on a screen, said electronic
7 programming guide indicating what programs are being provided on various channels;
8 and
9 displaying in one or more window regions within said programming guide a
10 plurality of said programs.

11
12 9. Method comprising:
13 displaying an electronic programming guide on a screen, said programming
14 guide indicating what programs are being provided on various channels; and
15 displaying in a window region within said programming guide at least one of
16 said programs, said displaying of at least one of said programs comprising a)
17 providing a pixel array depicting said at least one of said programs; b) binding said
18 pixel array to a geometric surface; and c) generating an image of said at least one of
19 said programs based on said pixel array bound to said geometric surface.

20
21 10. Method comprising:
22 displaying an electronic programming guide on a screen, said programming
23 guide indicating what programs are being provided on various channels; and

1 displaying in a window region within said programming guide at least one of
2 said programs, said displaying of at least one of said programs comprising using a 3D
3 graphics pipeline to generate images of said at least one of said programs.

4
5 11. Method comprising:

6 generating one or more images using a 3D graphics pipeline; and
7 displaying said images as part of an electronic program guide.

8
9 12. Method of claim 11 wherein said image comprises a pictogram, said
10 pictogram identifying a channel or program within said electronic programming
11 guide.

12
13 13. Method comprising generating one or more images by a) providing a
14 model of a geometric surface; b) binding visual information from a pixel array to said
15 geometric surface; and c) generating an image on a display device corresponding to
16 said model of said geometric surface and said pixel array, said image being part of an
17 electronic programming guide.

18
19 14. Method of claim 13 wherein said image comprises a pictogram, said
20 pictogram identifying a channel or program within said electronic programming
21 guide.

22
23 15. Method for displaying television program information on a display
24 device comprising displaying a grid containing one or more pictograms, said one or

1 more pictograms corresponding to one or more television programs, said pictograms
2 indicating to a viewer what programs are being shown on different television
3 channels.

4
5 16. Method of claim 15 wherein said pictograms contain color-coded
6 information.

7
8 17. Method of claim 15 further comprising clicking on one of said
9 pictograms to select a program corresponding to said one of said pictograms.

10
11 18. Method of claim 15 wherein said grid describes a channel indication,
12 said method further comprising clicking on said channel indication to select said
13 channel.

14
15 19. Method for displaying television program information on a display
16 device comprising providing a grid containing one or more pictograms, said
17 pictograms corresponding to one or more television channels, said pictograms
18 indicating to a viewer what channel a program is being shown on.

19
20 20. Method for displaying television program information on a display
21 device comprising displaying an electronic program guide containing a grid
22 containing one or more pictograms, said one or more pictograms corresponding to
23 goods or services that can be purchased.

1 21. Method of claim 20 wherein said grid also contains an indication of
2 television channels and programs being shown on said television channels.

3
4 22. Method of claim 20 further comprising clicking on said one or more
5 pictograms to obtain information on said goods and/or services or to order said goods
6 and/or services.

7
8 23. Method comprising:
9 displaying an electronic programming guide, said electronic programming
10 guide comprising indications of channels and programs showing on said channels;
11 and
12 displaying a television program on a video screen by moving a cursor to a
13 selected one of said indications of said programs, whereby said selected one of said
14 indications of said programs can be selected by a viewer directly.

15
16 24. Method of claim 23 further comprising clicking on said selected one of
17 said indications after said moving of said cursor to said selected indication.

18
19 25. Method comprising:
20 displaying an electronic programming guide, said electronic programming
21 guide comprising indications of channels and programs showing on said channels;
22 and

1 displaying a television program on a video screen by moving a cursor to a
2 selected one of said indications of said channels, whereby said selected one of said
3 channels can be selected by a viewer directly.

4
5 26. Method of claim 25 further comprising clicking on said selected one of
6 said indications after said moving of said cursor to said selected indication.

7
8 27. Method comprising:
9 displaying programming information from an electronic programming guide
10 on a video display device; and
11 selectively magnifying portions of the information displayed on said video
12 display device.

13
14 28 Method of claim 27 wherein said video display device comprises a
15 CRT screen, and LCD screen, or a video projection screen.

16
17 29. Method of claim 28 wherein said selectively magnifying comprises
18 choosing said portions to be selectively magnified by moving a cursor to a position at
19 or adjacent to said portions to be selectively magnified.

20
21 30. Method for using an electronic programming guide, said method
22 comprising:
23 providing a CPU coupled to a memory and a video display device;

1 broadcasting from a broadcast program source video programs to be displayed
2 on said video display device; and
3 receiving electronic program guide program software instructions from an
4 external source and loading said instructions into said memory; and
5 displaying on said display device electronic program guide information,
6 whereby during said displaying, said CPU executes instructions within said memory
7 that have been received from said broadcast program source.

8
9 31. Method of claim 30 wherein said electronic program guide program
10 software instructions are embedded within a signal transmitting one of said video
11 programs

12
13 32. Method of claim 30 wherein said electronic program guide program
14 software instructions are received from a server via a network.

15
16 33. Method comprising:
17 receiving information from a viewer selecting the size of one or more image
18 elements to be displayed on a video screen as part of an electronic programming
19 guide; and
20 using said electronic programming guide to display program information, said
21 program information comprising said one or more image elements, wherein said one
22 or more image elements has said selected size.

1 34. Method of claim 33 wherein said one or more image elements are
2 pictograms.

3
4 35. Method of claim 33 wherein said one or more image elements
5 comprise text.

6
7 36. Method comprising:
8 receiving information from a viewer selecting the color of one or more image
9 elements to be displayed on a video screen as part of an electronic programming
10 guide; and
11 using said electronic programming guide to display program information, said
12 program information comprising said one or more image elements, wherein said one
13 or more image elements has said selected color.

14
15 37. Method comprising:
16 receiving information from a viewer selecting the brightness of one or more
17 image elements to be displayed on a video screen as part of an electronic
18 programming guide; and
19 using said electronic programming guide to display program information, said
20 program information comprising said one or more image elements, wherein said one
21 or more image element has said selected brightness.

22
23 38. Method comprising:

1 receiving information from a viewer selecting the brightness of at least a
2 portion of an electronic programming guide; and
3 using said electronic programming guide to display program information, at
4 least a portion of said program information being displayed at said selected
5 brightness.

6
7 39. Method comprising:
8 receiving information from a viewer selecting the color of part of an electronic
9 programming guide; and
10 using said electronic programming guide to display program information, at
11 least a portion of said program information being displayed in said selected color.

12
13 40. Apparatus comprising:
14 a screen for displaying a video program; and
15 an electronic program guide for displaying television program information on
16 a window within said screen while a video program is displayed another portion of
17 said screen outside of said window.

18
19 41. Apparatus of claim 40 wherein said electronic program guide
20 comprises an array indicating what programs are showing on a set of channels, said
21 array comprising one or more pictograms identifying one or more of said programs.

22
23 42. Apparatus comprising of claim 40 wherein said electronic program
24 guide comprises an array indicating what programs are showing on a set of channels,

1 said array comprising one or more pictograms identifying one or more of said
2 channels.

3
4 43: Apparatus comprising:
5 a video display device;
6 a receiving circuit for receiving a plurality of video programs from a video
7 program source; and
8 an electronic program guide for displaying video program schedule
9 information, said electronic program guide comprising one or more window regions
10 for displaying a plurality of said video programs simultaneously with said video
11 program schedule information.

12
13 44. Apparatus comprising:
14 a screen for displaying video programs; and
15 a video control circuit coupled to said screen, said video control circuit
16 causing said screen to display an electronic programming guide, said electronic
17 programming guide being in the form of an array, said array comprising one or more
18 pictograms for identifying one or more programs.

19
20 45. Apparatus of claim 44 wherein said pictograms are non-alphanumeric.

21
22 46. Apparatus of claim 44 further comprising a 3D graphics pipeline for
23 generating said pictograms.

1 47. Apparatus comprising:

2 a screen for displaying video programs; and

3 a video control circuit coupled to said screen, said video control circuit

4 causing said screen to display an electronic programming guide, said electronic

5 programming guide being in the form of an array, said array comprising one or more

6 pictograms for identifying one or more channels.

7
8 48. Apparatus comprising:

9 a screen for displaying video programs; and

10 a video control circuit coupled to said screen, said video control circuit

11 causing said screen to display an electronic programming guide, said electronic

12 programming guide being in the form of an array, said array comprising one or more

13 pictograms for identifying goods and services that can be ordered using said

14 electronic programming guide.

15
16 49. Apparatus comprising:

17 a video display device for displaying visual information;

18 a 3D graphics pipeline generating images of elements; and

19 a video display circuit displaying on said video display device an electronic

20 programming guide comprising images generated by said 3D graphics pipeline.

21
22 50. Apparatus comprising:

23 a memory storing pixel array information and information corresponding to

24 the shape of a geometric surface;

1 a circuit for mapping said pixel array information to said geometric surface
2 and generating an image corresponding to said pixel array information as mapped
3 onto said geometric information; and
4 a video display device displaying an electronic programming guide
5 comprising said image.
6

7 51. Apparatus comprising:
8 a display device for displaying visual information;
9 a receiving circuit for receiving video programs and displaying said video
10 programs on said display device; and
11 a circuit for providing an electronic programming guide on said display
12 device, wherein when said electronic programming guide is displayed on said display
13 device, said electronic programming guide has one or more windows for displaying a
14 plurality of said video programs.
15

16 52. Apparatus of claim 51 wherein said circuit comprises a memory for
17 storing a stream of pixel arrays corresponding to said plurality of said video
18 programs; and
19 a pipeline for mapping said pixel arrays onto geometric surfaces to generate a
20 stream of output pixel arrays, said stream of output pixel arrays being displayed on
21 said display device as part of said electronic programming guide.
22

23 53. Apparatus comprising:

1 a screen for displaying an electronic programming guide, said electronic
2 programming guide comprising a set of indicators indicating channels and a set of
3 indicators indicating what television programs are playing on said channels, said
4 screen also displaying a cursor; and
5 a controller for moving said cursor to or adjacent to one of said indicators to
6 select the channel or program corresponding to said indicator.

7
8 54. Apparatus of claim 53 wherein said controller is a remote controller
9 comprising a touch pad, a mouse, a joystick, a set of arrow buttons, or a track ball for
10 manipulating the position of said cursor.

11
12 55. Apparatus comprising:
13 a display device for displaying an electronic programming guide; and
14 a controller for identifying a portion of said electronic programming guide and
15 causing said identified portion of said electronic programming guide displayed on
16 said display device to be magnified.

17
18 56. Apparatus comprising
19 a display device for displaying an electronic programming guide, said
20 electronic programming guide comprising an array of elements communicating
21 program and channel information;
22 a memory containing information corresponding to the size of at least some of
23 said elements; and

1 a controller for modifying the information stored in said memory to control the
2 size of said at least some of said elements.

3
4 56. Apparatus comprising
5 a display device for displaying an electronic programming guide, said
6 electronic programming guide comprising an array of elements communicating
7 program and channel information;
8 a memory containing information corresponding to the color of at least part of
9 at least some of said elements; and
10 a controller for modifying the information stored in said memory to control the
11 color of said at least part of at least some of said elements.

12
13 57. Apparatus comprising
14 a display device for displaying an electronic programming guide, said
15 electronic programming guide comprising an array of elements communicating
16 program and channel information;
17 a memory containing information corresponding to the brightness of at least
18 part of at least some of said elements; and
19 a controller for modifying the information stored in said memory to control the
20 brightness of said at least part of at least some of said at least some of said elements.

21
22 58. A video system comprising:
23 a CPU;

1 a memory coupled to said CPU, said memory containing instructions to be
2 executed by said CPU;
3 a video display device, said CPU causing said video display device to display
4 an electronic programming guide; and
5 circuitry for loading software instructions into said memory from a source
6 external to said video system, whereby the instructions to be executed by said CPU
7 can be updated.

8
9 59. Apparatus of claim 58 further comprising a receiver circuit for
10 receiving video signals, said software instructions being embedded within the signals
11 received by said receiver, said software instructions received by said receiver being
12 communicated to said memory.

13
14 60. Apparatus of claim 58 further comprising a circuit for coupling said
15 video system to a network, said circuit for coupling receiving said software
16 instructions.

17
18 61. A method comprising:
19 positioning a plurality of geometric surfaces in a virtual 3D space;
20 receiving schedule information from a data source;
21 generating a set of images in response to said schedule information;
22 applying said set of images as textures to at least some of said geometric
23 surfaces;
24 receiving video data from a video data source;

1 applying said video data onto at least one of said geometric surfaces within
2 said plurality of geometric surfaces; and
3 displaying said geometric surfaces with said video data and said images
4 applied thereto.

5
6 62. Method of claim 61 wherein said video data is a video data stream
7 comprising a video program, a commercial, a preview clip, or a video clip stored on a
8 hard disk drive.

9
10 63. Method of claim 61 further comprising altering the image displayed on
11 one of said geometric surfaces in response to the actuation of a control element on a
12 remote controller.

13
14 63. Method of claim 61 further comprising receiving visual information
15 from the internet, applying said visual information as a texture to one of said
16 geometric surfaces.

17
18 64. Method of claim 63 wherein said visual information received from the
19 internet is in the form of HTML data, said method further comprising parsing said
20 HTML data and mapping visual information corresponding to said HTML data onto
21 one or more of said geometric surfaces.

22
23 65. A method comprising:

1 providing a model of one or more images in the form of a geometric surface
2 and an image bound to said geometric surface;
3 displaying said image on a visual display device, said image being part of an
4 electronic programming guide; and
5 changing the position or size of said image by changing the location, in virtual
6 space, of said geometric surface.

7
8 66. A method comprising:

9 providing a model of one or more images in the form of a geometric surface
10 and an image bound to said geometric surface;
11 displaying said image on a visual display device by rendering the image from
12 the perspective of a virtual viewer at a first location; and
13 changing the position or size of said image by re-rendering the image from the
14 perspective viewer at a second location.

FIG. 1
(PRIOR ART)

1 / 7

	10:00	10:30	11:00
2	—	—	—
3	—	—	—
4	—	—	—
5	—	—	—
6	—	—	—

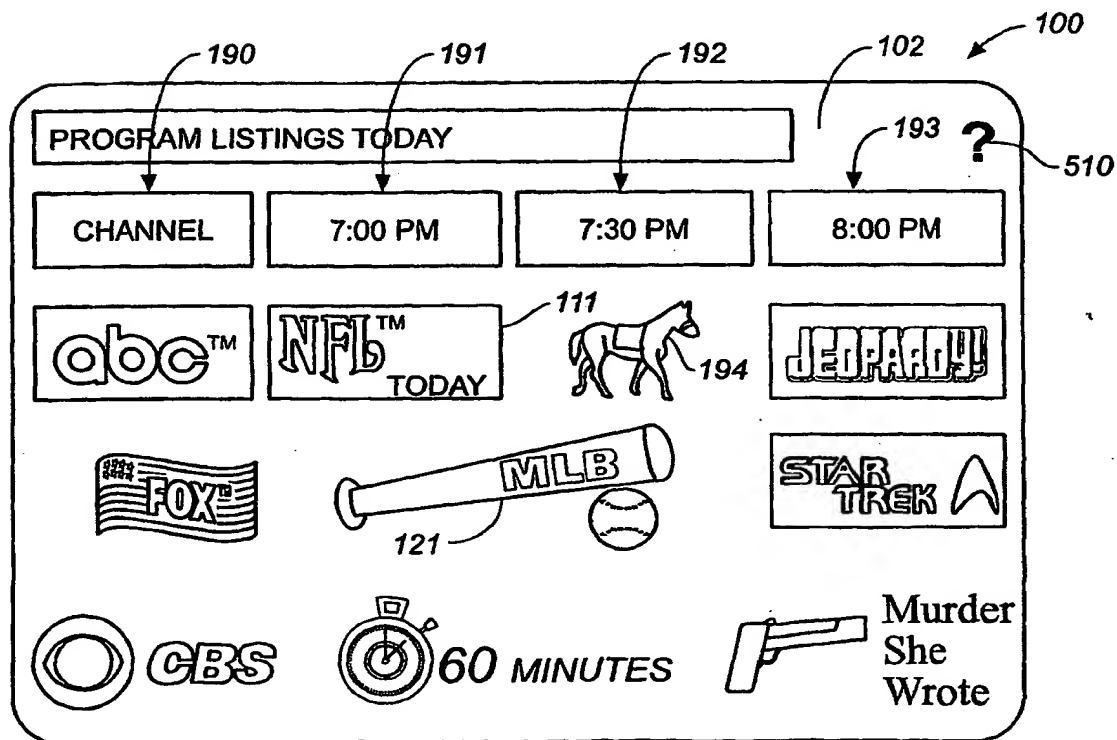


FIG. 2A

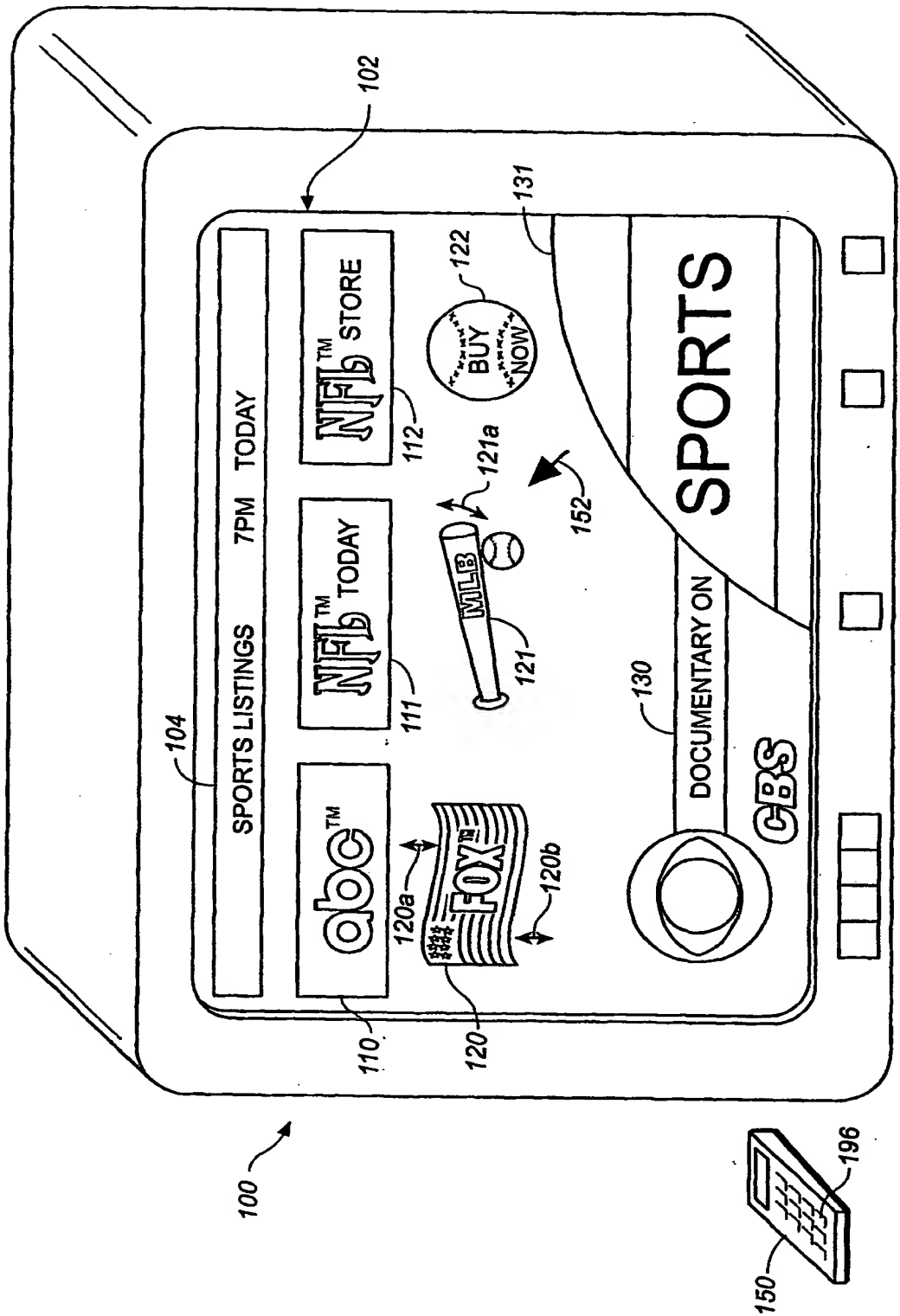
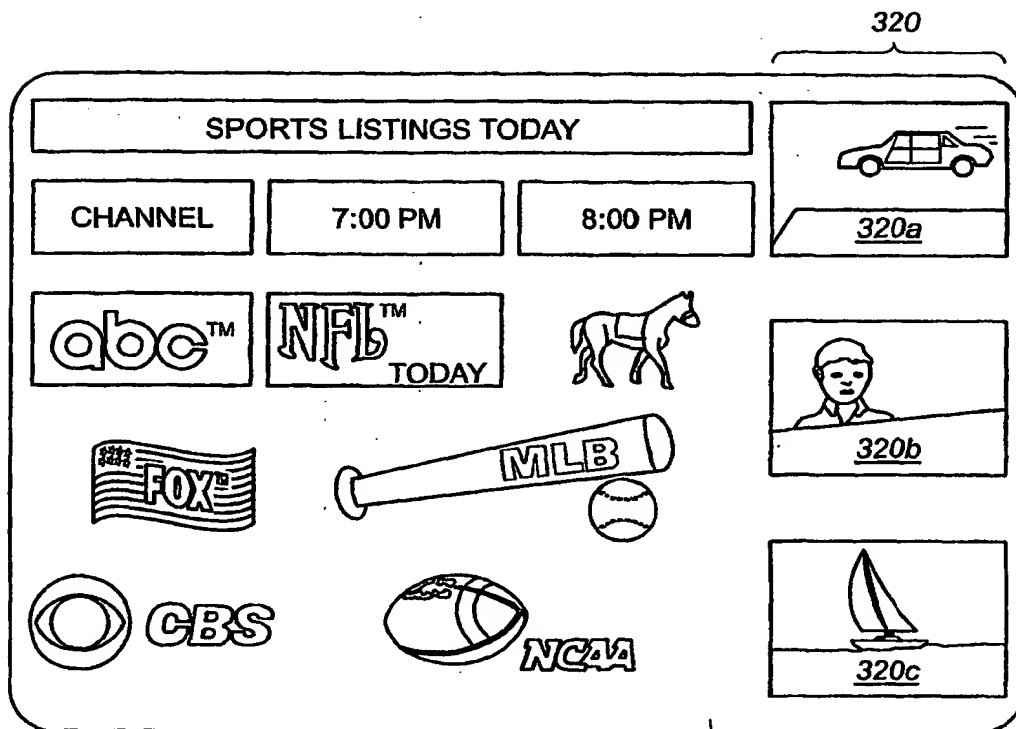
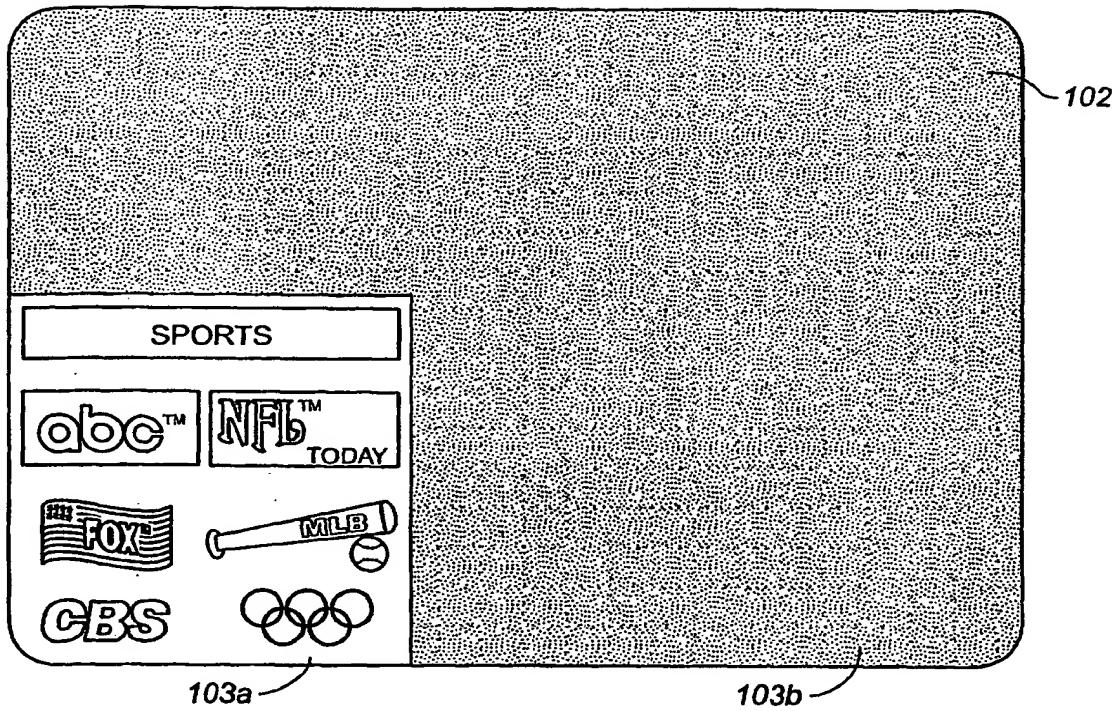
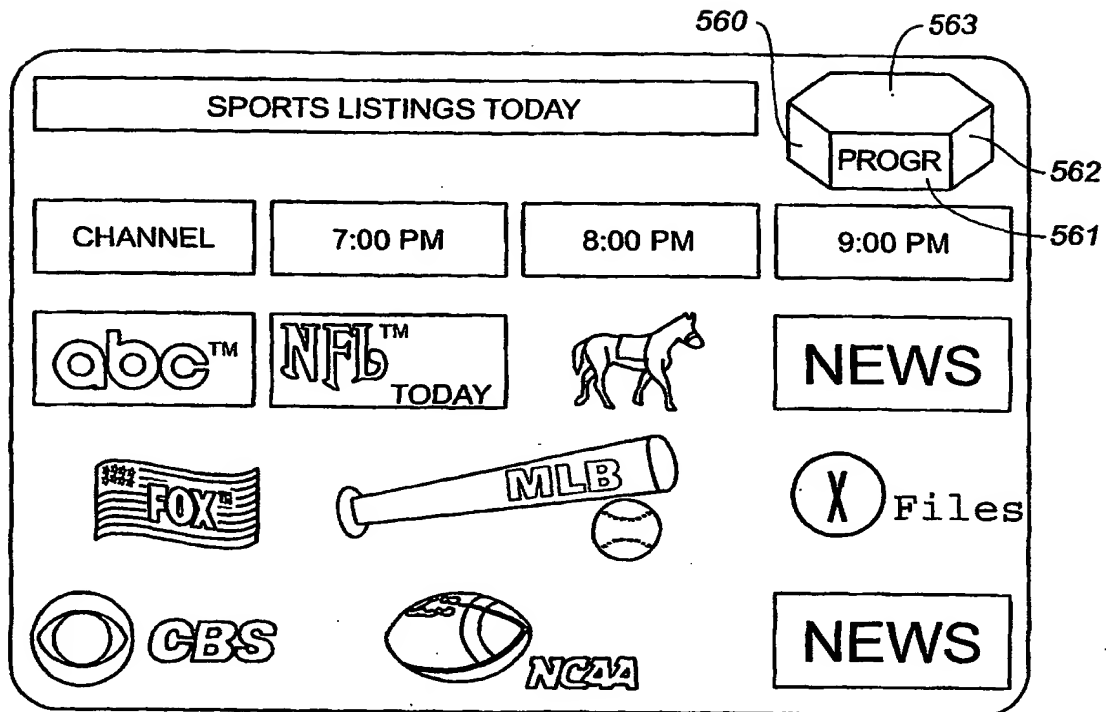
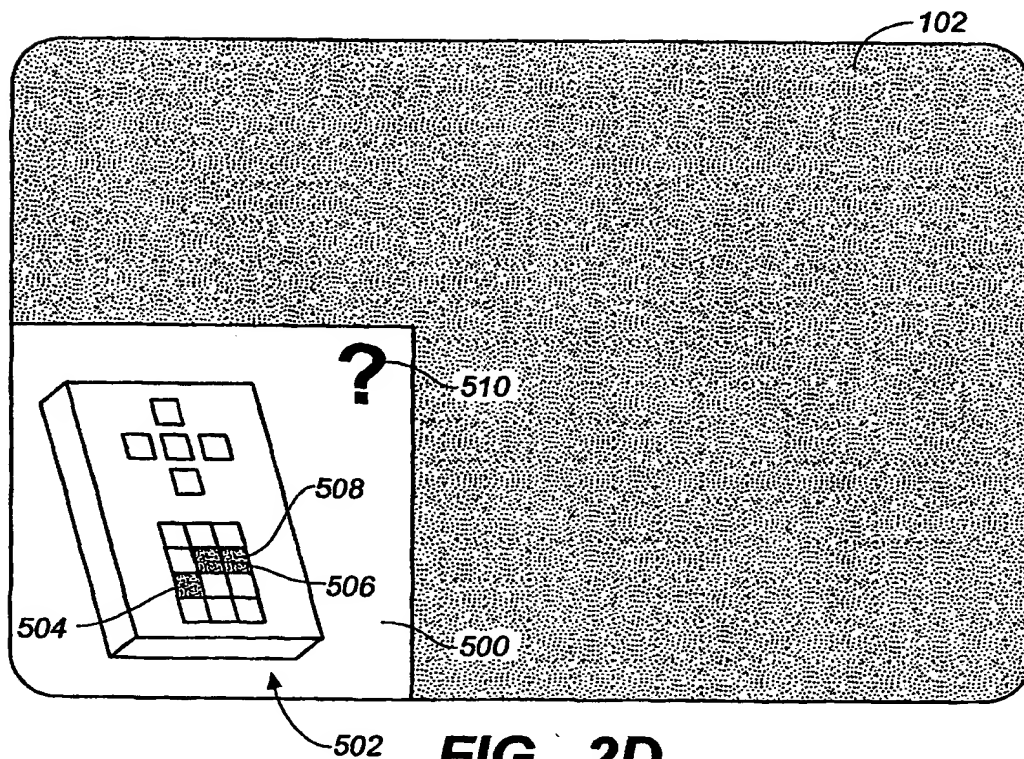


FIG. 2

3 / 7



4 / 7

**FIG. 2C'****FIG. 2D**

5 / 7

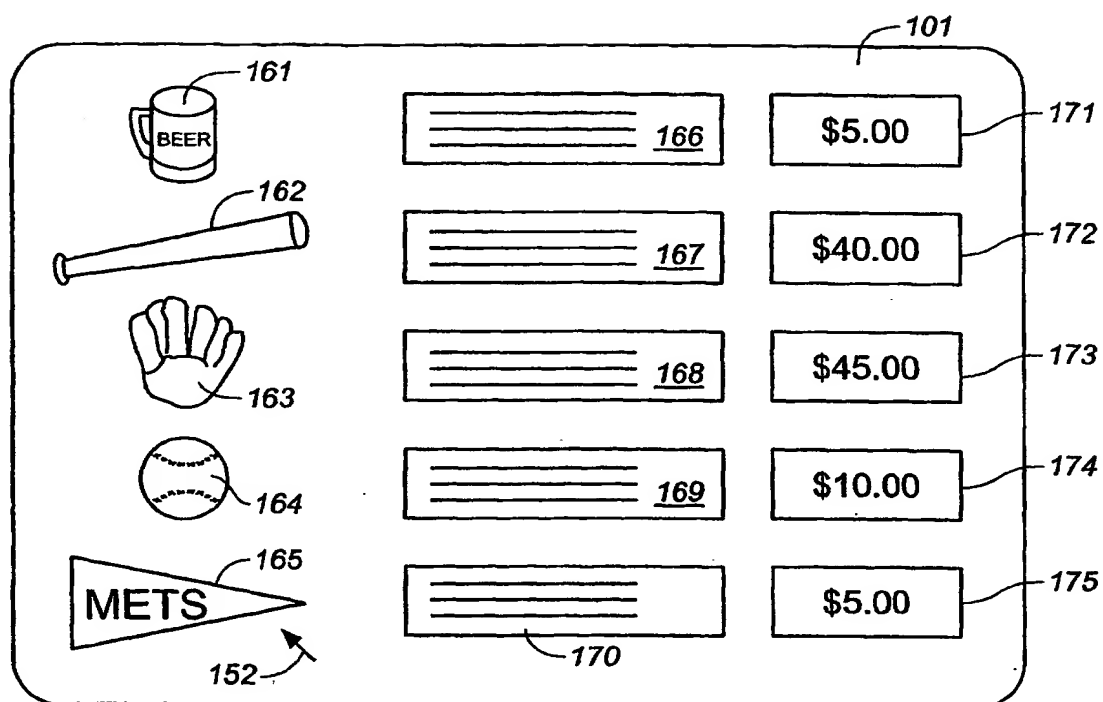


FIG._3

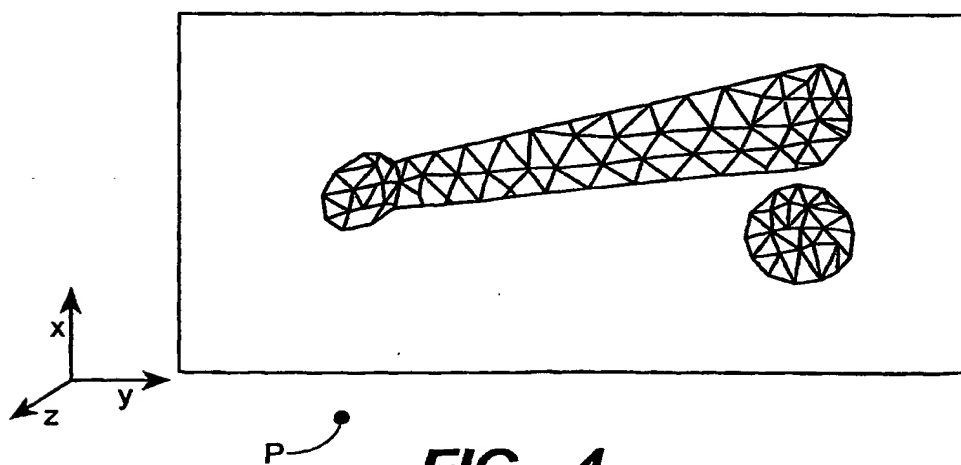


FIG. 4

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US01/01054

A. CLASSIFICATION OF SUBJECT MATTER

IPC(7) : G06F 3/14; H04N 5/445, 7/14

US CL : 345/327, 355, 334, 339, 962; 725/39, 43, 60

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 345/327, 355, 334, 339, 962, 357, 333, 349, 348, 419, 425, 427, 976, 329, 346, 972, 725/39, 43, 60, 42, 47, 61, 38, 709/217, 219

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EAST IS&R/BRIS QUERY

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X --- Y	US 5,850,218 A (LAJOIE et al) 15 December 1998, abstract; figs 16 - 17; col 2, lines 8 - 12, 52 - 58; col 5, line 45 - col 6, line 3; col 6, line 14 - col 7, line 12; col 15, lines 9 - 35; col 16, lines 24 - 28; col 19, line 39 - col 20, line 8.	1-3,8,15,17-19,23-26, 40-45,47, 51,53-54 ----- 4-7,9-14,16 ,20-22,27- 39,46,48- 50,52,55- 68
Y	US 5,724,492 A (MATTHEWS, III et al) 03 March 1998, abstract; figs 6-7, 10; col 3, line 52 - col 4, line 6; col 15, lines 15 - 67.	5-7,9-14, 46,49-50, 52,62- 68

☒ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

* Special categories of cited documents:	*T* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
A document defining the general state of the art which is not considered to be of particular relevance	*X* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
E earlier document published on or after the international filing date	*Y* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
L document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	*Z* document member of the same patent family
O document referring to an oral disclosure, use, exhibition or other means	
P document published prior to the international filing date but later than the priority date claimed	

Date of the actual completion of the international search

04 JUNE 2001

Date of mailing of the international search report

27 JUN 2001

Name and mailing address of the ISA/US
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INTERNATIONAL SEARCH REPORT

International application No.
PCT/US01/01054

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 5,579,057 A (BANKER et al) 26 November 1996, abstract; figs 10, 14, 22, 23; col 2, lines 19 - 30, 40 - 59; col 3, lines 37 - 47; col 11, lines 29 - 55; col 21, line 58 - col 22, line 2.	4,16,27-29,33-39,55-58
Y	US 5,889,950 A (KUZMA et al) 30 March 1999, abstract; figs 5 - 7; col 2, lines 38-42; col 5, lines 10 - 22; col 7, lines 18 - 47.	30-32,59-61,65-66
Y	US 5,485,197 A (HOARTY) 16 January 1996, abstract; figs 33 - 36, 38; col 18, line 49 - col 19, line 28.	6-7,68
Y	US 5,940,073 A (KLOSTERMAN et al) 17 August 1999, abstract; fig 2(b); col 1, line 63 - col 2, line 41; col 6, lines 47 - 57; col 7, lines 36 - 45.	20-22,48

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US01/01054**Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)**

This international report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:
2. ☐ Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:
3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

Please See Extra Sheet.

1. ☒ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest ☐ The additional search fees were accompanied by the applicant's protest.
☐ No protest accompanied the payment of additional search fees.

BOX II. OBSERVATIONS WHERE UNITY OF INVENTION WAS LACKING

This ISA found multiple inventions as follows:

This application contains the following inventions or groups of inventions which are not so linked as to form a single inventive concept under PCT Rule 13.1. In order for all inventions to be searched, the appropriate additional search fees must be paid.

Group I, claim(s) 1 - 8, 15 - 19, 23 - 26, 30 - 32, 40 - 47, 51 - 54, 59 - 61 (as renumbered), drawn to an electronic program guide system for use in a video system that makes use of standard window and menu constructs, downloaded executables in a network and cursor pointing device inputs.

Group II, claim(s) 9 - 14, 49 - 50, 62 - 68 (as renumbered), drawn to the use of a geometric solid in rendering an environment for the control of video programming.

Group III, claim(s) 20 - 22, 48, drawn to a system for presenting video programming that also contains graphical indications of goods or services that may be purchased.

Group IV, claims 27 - 29, 33 - 35, 55 - 56, drawn to an electronic programming guide system in which the size of items may be changed.

Group V, claims 36 - 39, 57 - 58 (as renumbered), drawn to an electronic programming guide having elements whose coloration (e.g., color or brightness) may be varied.

The inventions listed as Groups I, II, III, IV and V do not relate to a single inventive concept under PCT Rule 13.1 because, under PCT Rule 13.2, they lack the same or corresponding special technical features for the following reasons: The programming guide arrangement of invention I lacks the special technical features relating to geometric objects (invention II), the purchase of goods or services (invention III), relative size (invention IV) or variable coloration (invention V). Invention II's geometric shape utilization is not explicitly concerned with the application to sales (invention III) or graphical attributes (inventions IV, V). Invention III's provision for the purchase of goods and services lacks the special technical features related to graphical attributes (inventions IV, V), and invention IV's size determination lacks the special technical features related to invention V's variability in color or brightness.

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